

Railroad Age Gazette

Including the Railroad Gazette and The Railway Age

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The returns printed elsewhere of the New Haven's football business are impressive enough whether viewed in their operating or fiscal results. If collateral revenue is reckoned in—the trolleys, outside games during the season and scattered football traffic—probably the New Haven company takes in gross from football not less than \$120,000 a year or nearly double the average day's nominal revenue from passenger business on a large system with great passenger traffic. To handle within a few hours 121 trains with nearly 40,000 football passengers without mishap or serious delay is surely a feat of such magnitude and skill as dwarfs such minor incidents of mere inconvenience as 1,161 passengers in a twelve-car train to New York immediately after the game. But there are some offsets to the railroad profits of a "big" football day. We speak with indirect authority in stating that the higher officers of the New Haven system question whether football receipts really compensate for the suspension of freight traffic during half a day and for the stress and strain of the thought that a single bad accident may eat up the net football revenue of a decade. But, whatever the contingency, the fact bulks large that, in these days of magnified football, a railway reaps

rich harvest of dollars when it reaches any big university where Hercules jostles Minerva.

It was something like 30 years ago, if the editor's memory serves him, that an officer of the Atchison, Topeka & Santa Fe headed off an applicant for a pass by citing the various passages of holy writ that seem to forbid free transportation, and thereby got a free advertisement for his road in every country newspaper throughout this land. ("Copy" based on scripture is always popular in newspaper offices.) Other officers and other roads have taken advantage of the same argument many times; but it has remained for the Atchison itself to bring the "authority" up to date, as will be seen by the "pass," recently issued, which is shown in facsimile herewith. The Bible has been revised twice within these 30 years, but not until now has anybody discovered that the Bible and the

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The Atchison, Topeka & Santa Fe Ry.

ALL SYSTEM LINES

Pass M. E. Knott

Acct. The following Biblical injunctions:

Thou shalt not pass.—Gen. 31, 32.
Pass not thither.—II Kings 9, 9.
He cannot pass.—Job 14, 5.
They may not pass.—Psalm 104, 9.
None shall pass.—Isa. 34, 10.
No man may pass.—Ezek. 14, 15.
The wicked shall no more pass.—Zeph. 1, 15.
No oppressor shall pass.—Zech. 9, 8.
The unclean shall not pass.—Isa. 35, 8.
There shall be no strangers pass.—Joel 3, 17.

This generation shall not pass.—Mat. 24, 34.
They which would pass cannot.—Luke 16, 26.
Though they roar, yet can they not pass.—Jer. 5, 22.
But the simple pass on and are punished.—Prov. 24, 3.
Suffer not a man to pass.—Judges 3, 28.
So he paid the fare and went.—Jonah 1, 3.
Go and do thou likewise.—Luke 10, 37, and the Interstate Commerce Commission.

SUBJECT TO SUGGESTIONS ON BACK HEREOF

Interstate Commerce Commission are in the same class as authorities on business ethics and morality in general. It is eminently proper, of course; though to most railroad men the dicta of the Commission, like those which emanate from the White House, have seemed more like those of the Medes and Persians, which are quite different from anything ever given out by such fair-minded men as Moses and St. Paul. In one important point the Commission seems to differ from the Supreme Lawgiver. In all but two of the 16 cases cited the failure to secure free transportation resulted, apparently, in a loss to the transportation company, for there is nothing to show that the applicant took the proposed journey. It is a fair conclusion that he stayed at home. Staying at home therefore has the most weighty authority. This proportion—two out of 14 who really mean business—is about the proportion in the modern railroad era. Refuse to give a man a pass and you not only lose what he would have paid for berths and meals but also lose the benefit of his presence on the trains when travel is dull. The fourteenth man, in the list, who was "punished" probably was a tramp, and rode on the blind baggage. The 16th, Jonah, paid his fare, and now becomes the model which the government sets up as an example. Why the Commission should thus encourage travel, when people's incomes are reduced, is a mystery. Has the Commission lost its non-partisan character and determined to support the Republican administration in forcing prosperity on the country?

PROTECTIONISM AND RAILWAY REGULATION.

The current simultaneous discussion of railway regulation and tariff revision calls attention to the sharp contrast between the policies of the federal government in dealing with manufactures and with railways. Except agriculture, manufactures and rail transportation are the country's largest industries. The government formerly gave direct encouragement to both—the railways by land grants and the loan of public moneys; to manufacturers by bounties and a protective tariff. It still fosters manufacturers by import tariffs, but its attitude

toward railways has become such as to hinder rather than further their development. We shall not discuss here the wisdom either of railway regulation or of protection, as such, but shall only note how some of the inconsistencies of the two policies as at present applied affect railways.

The purpose of protection is to safeguard American producers—and manufacturers chiefly—against foreign competition. Does the government do anything to protect the railways against competition? It leaves them to meet as best they can such foreign competition as that of the Canadian railways, the Tehuantepec National Railway across the Isthmus of Tehuantepec, and ocean steamships carrying goods to the Orient via the Suez Canal. In addition, it fosters domestic competition with the railways by spending millions to improve the harbors upon the Great Lakes, and by spending other millions upon the Panama Canal; and now it is proposed to lay out still other millions from the national treasury in developing inland waterways to regulate railway freight rates.

The protective tariff enables—is intended to enable—American manufacturers to charge higher prices than they could charge without it; and largely owing to this the level of prices is higher here than anywhere else in the world. On the other hand, railway rates in the United States are lower than anywhere else in the world; and the government has created especially to control them a commission which is constantly issuing orders to prevent advances or compel reductions. Many of the manufacturers who charge higher prices for their goods than they could without the protective tariff are among the first and loudest to complain to the Interstate Commerce Commission when the railways seek to make a slight advance in freight rates; they seek and secure the aid of the government in getting high prices for what they sell and for a low price the transportation that they buy. When it is shown that manufacturers, owing to protection, have been able to get high prices and pay large dividends—often on stock containing as much water as the worst over-capitalized railway—it is considered cause for public rejoicing. Since it is considered a good thing for the country for manufacturers, with the aid of protection, to get high prices and large dividends, why should it not be considered a good thing for the railways, without the aid of governmental protection of any kind, to get high rates and pay big dividends?

While the government is helping manufacturers to get high prices for what they sell, and low rates for the transportation they buy, it is not only reducing the prices the railways get from the transportation they sell, but is also increasing the prices of the things they buy. The railways are among the largest consumers of manufactured goods; and their operating expenses are heavily increased by the tariffs upon paper, lumber, oil, iron, steel and many other commodities. A. B. Farquhar, in an article in the *Annals of the American Academy of Political and Social Science* for September, estimates the maximum cost to the United States Steel Corporation of making steel rails at \$16 per ton; others place it lower. The English price is stated to be \$20. It is generally conceded, we believe, that it is chiefly the tariff that enables the steel corporation to charge American railways \$28. This is a good instance, but far from the only one, of how the tariff raises railway expenses. Protection raises the money wages of employees of protected industries, and thereby the cost of labor to railways; for the railways can get enough labor, skilled or unskilled, only by paying it approximately the same wages it can get elsewhere. Some day, perhaps, the public will begin to ask: "If the manufacturers must have protection in order to pay higher wages than foreign manufacturers, is it fair to attack the railways when they pay higher prices for materials and higher wages than any foreign railways, and at the same time sell freight transportation—to these same protected manufacturers, among others—much cheaper than railways in any other country sell it?"

The law says that the manufacturer may discriminate be-

tween his patrons as he pleases, but that the railway may not unfairly discriminate between its patrons, because it is an agent of the government. But if it is wrong for the agent—the railway—unfairly to discriminate, can it be right for the principal—the government—unfairly to discriminate? And is the government not unfairly discriminating when it makes one law to enable one large class of industries—manufacturers—to charge high prices and earn large profits, and makes another law and creates a special commission to prevent another large class of industries—railways—from charging rates high enough to earn large profits on the private capital invested in them?

We do not say that the general policy of protection is or is not a good thing; it is outside of our province to discuss that policy. We do not say that the prices of the steel rails and other railway materials are too high. We do not say that the wages of railway labor are too high. But it ought to be plain to every fair man that a policy of protection and a policy of railway regulation, which, between them, tend to make the expenses of railways big and their rates and earnings small, are unjust to railways. They also, taken together, are inexpedient. No government can long thus discriminate between two of its greatest industries without crippling the one discriminated against and thereby, in the long run, crippling all other industries.

LIMITATIONS OF THE RIGHT TO STRIKE.*

The labor union may by combination force an increase of cost, with the result of raising the price of commodities, while other individuals and corporations may not do so. Labor can obtain a monopoly, while capital must not. Mr. Merritt finds in judicial decisions a tendency to right this wrong by restricting strikes to their only legitimate purpose, the benefit of the strikers, and to a narrower definition of lawful methods. He gives references to more than 100 decisions, and his pamphlet is worth studying. It is a pity that it is not written and arranged for easier reading.

A strike, a sympathetic strike, and a boycott are three different kinds of undertakings, with distinctions not always clearly understood by those who use the words. Although the primary difference, the difference of intent, has been clearly defined by the courts, it is not fully recognized by law. Some decisions are confusing.

The abstract right to strike is unquestioned. Scores of decisions confirm it, as in a federal court decision: "Laboring men have the legal right to strike at will with or without good reason, singly, collectively or as a union." The New York State Court of Appeals gives laborers "the right to strike for any reason they deem a just one."

These and similar decisions, carelessly read, seem to give to one class of our citizens the legal right to conspire primarily for the purpose of injuring another—a right not granted to any other class. A boycott is illegal, because its purpose to injure another is illegal. It is claimed, with some force, that a strike to compel the employer to stop buying non-union material is essentially a boycott, because its purpose is, not to benefit the strikers, but to injure the maker of non-union material. There is a growing tendency in court decisions to inquire into the objects of a strike before affirming its legality. In Connecticut it is held that "a strike may be lawful, or it may be unlawful and criminal." In Massachusetts: "It is settled that some strikes by labor unions are illegal."

The clearest definition of lawful and unlawful purpose is made by the highest court in Virginia:

"It is lawful for workmen to combine to control the terms of their own hiring, and such a combination is easily distinguishable from one in which the purpose is to control the business of the employer in

*"Limitations of the Right to Strike." By Walter Gordon Merritt. Pamphlet; 27 pages. Published for circulation by the American Anti-Boycott Association, 27 William street, New York.

other matters not affecting the terms of their own hiring, as for example, the prevention of the employment of non-union men."

A lack of precision in definition, both by laymen and by the courts, seems to be responsible for some of the confusion in ideas and some of the apparent contradictions in decisions. The Pullman strike in 1893 appeared to most people to be a sympathetic strike, and yet Judge Taft in his ruling referred to it as a boycott, while at the same time apparently holding that it was properly termed a strike. This, however, did not confuse him.

Government recognizes the right and undertakes to protect the individual in the lawful management of his property and business and punishes all except labor unions who undertake to interfere with that right. The only interference tolerated by the law is that which is inseparable from the exercise of paramount rights by others. The essential element in the distinction is the purpose, the intent, and this at once differentiates the strike against non-union men or material from the legal withdrawal for the benefit of those who so combine.

The Massachusetts Supreme Court makes this quite clear in a decision: "In our opinion organized labor's right of coercion and compulsion is limited to strikes on persons with whom the organization has a trade dispute."

Judge Taft's decision on the sympathetic strike of 1893 by trainmen against the use of Pullman cars defines the application of the principle:

"All the employees had the right to quit their employment, but they had no right to combine to quit, in order thereby to compel their employer to withdraw from a mutually profitable relation with a third person for the purpose of injuring that third person when the relation thus sought to be broken had no effect whatever on the character or reward of their services. It is the motive for quitting and the end sought thereby that make the injury inflicted unlawful, and the combination by which it is effected an unlawful conspiracy."

The somewhat ponderous language used in a United States Supreme Court decision of one of these cases is a statement of the basic principle:

"It has been considered that *prima facie* the intentional infliction of temporal damages is a cause of action which as a matter of substantive law, whatever may be the form of pleading, requires a justification if the defendant is to escape."

Quitting railway service suddenly, or in any way interfering with the performance of the railway's public duty, is an unlawful act not yet clearly and definitely passed on, but there is unquestionably a responsibility for those in railway work which does not exist for those in other than public service corporations.

It seems to be clear from the cases cited in Mr. Merritt's pamphlet that railway companies have a plain duty to enforce the present law, and that apparently no additional legislation is needed.

WEIGH THE MAILS ANNUALLY.

The action of the postoffice department in ordering that after January 1, 1909, railways shall be paid monthly instead of quarterly for hauling the mails, and in deciding to discontinue penalizing them for delayed trains, are moves toward putting the relations between the government and the railways on a fairer and more businesslike basis. The department has been paying everybody but the railways monthly, and it readily conceded the justice of treating them similarly when the matter was brought in proper form to its attention. Similarly, the department saw the futility and unfairness of penalizing the roads for delayed mail trains when the true conditions were laid before it. There is always competition in service between the roads for all kinds of traffic. They get but a little over 2 per cent. of their revenue from the mail business. Plainly, if their rivalry for 98 per cent. of the business would not cause them to get their trains over the road in the shortest practicable time, penalties for delays in handling 2 per cent. of the business must be merely an ineffective irritant. The cost to the roads of keeping and furnishing to

the department detailed records of all delays to mail trains has been, in the aggregate, very large, and out of all proportion to the benefit that the government has got or possibly could get from it.

There should be legislation by Congress that will let the postoffice department take other steps toward establishing businesslike relations between the government and the railways. The method of fixing the compensation for hauling the mails sadly needs to be put on a common sense basis.

Under existing law the mails are weighed 105 consecutive days once in four years. The compensation of each road for the next four years is based on the amount of mail that it carries during the weighing period; it gets the same the fourth year that it does the first. The total amount of mail carried fluctuates considerably. During a time of business depression it falls off. Under normal conditions it increases from 15 to 25 per cent. in four years. Now, it is evident that when, as is usually the case, the amount of mail increases, if the roads are paid enough at the beginning of the four-year period they will be paid too little at its end; and if they are paid enough at the end they must have been paid too much at the beginning. It is not at all probable that compensation arbitrarily fixed at the beginning will turn out on the average to be just throughout the entire period to both carriers and government.

This method of fixing compensation also often works unfairly as between the roads. It often results in one road being paid for what another does. Specific examples are more instructive than vague generalities, and we will give two rather striking instances.

The Modern Woodmen of America, a fraternal insurance order, publishes a monthly paper having a circulation of about 1,200,000 copies. When the mails were weighed in July, 1907, this paper, making about 85 tons of mail matter a month, was issued from Indianapolis, Ind., and the roads at Indianapolis got credit for hauling it. Subsequently the publication office was moved to Rock Island, Ill., the first issue from there being that of October, 1908. Consequently, the lines at Rock Island—the Chicago, Rock Island & Pacific, the Chicago, Burlington & Quincy, and the Chicago, Milwaukee & St. Paul—are now making the initial hauls of this paper, which amount for the Rock Island to 57½ tons per month, for the Burlington to 21½ tons, and for the St. Paul to 7 tons. The lines at Indianapolis hauled it 15 months and get paid for hauling it four years, while the lines at Rock Island must haul it 33 months for nothing. Besides, a new paper has been started at Rock Island by the woman's auxiliary of the Modern Woodmen, the Royal Neighbors of America, and this paper also, which circulates 260,000 copies and amounts to 9 tons a month, must be hauled for nothing for 33 months by the Rock Island, the Burlington and the St. Paul.

The second instance we have in mind relates to the transportation of the mail from Washington, D. C., to New Orleans, La., and other points in the same territory. When the mails were weighed the Southern Railway was hauling this mail. Adverse federal and state legislation and the business depression forced it to cut its expenses wherever possible, and it took off some of its fast trains. This made it necessary for the postoffice department, in order to get the New Orleans mail to destination in the least practicable time, to route it over the Pennsylvania System to a connection with the Illinois Central near St. Louis, and thence over the Illinois Central. So the Southern is now being paid for a service that is being given by the Pennsylvania and the Illinois Central.

These instances are illustrative. The postoffice officials and the mail representatives of the railways could cite innumerable similar examples of the absurd and unfair results to which the present method of fixing the pay of the railways leads. The reader who has seen much in the daily press about the "fat contracts" of the roads with the postoffice department will wonder why the department does not hold the

roads to these contracts. The fact is, there are no contracts, fat or lean. The department, as already stated, fixed the compensation of each road once in four years, basing it upon the amount of mail handled by the road during the weighing period. It can and will compel the road to haul the mail between any two points as long as it has the fastest train service between those points, and can penalize it for not running the trains on schedule time. But no road is bound by contract or otherwise to keep on running a train on which it hauls mail or to keep in effect any particular schedule. If a road that has been hauling the mail chooses to take off or lengthen the schedule of a train, or some competing road puts on a faster train, the department can and will take the mail from the former and make the latter haul it. In other words, the department has no power to make a road perform the service for which it is paid, but it has power to compel a road to perform a service for which it is not paid!

The ideal remedy for this grotesque situation probably would be for Congress to fix reasonable rates per 100 pounds—or per car mile, where entire cars are used—and to pay each road for exactly the amount of service it renders. There is a number of reasons, however, why this arrangement might be impracticable. But it seems to admit of no serious question that Congress, during its present session, ought, at least, to provide for annual instead of quadrennial weighing. The fluctuation in the aggregate amount hauled by all lines and in the relative amounts hauled by different roads, is much less in one than in four years, and therefore annual weighing would lead to much fairer results than does quadrennial weighing.

Should annual weighing be adopted, in justice to the railways and for the good of the mail service it should not be attended by any reduction of the present rates of pay. Since March 2, 1907, through legislation by Congress and orders of the postmaster-generals there have been four substantial reductions in these rates. (See *Railroad Age Gazette*, October 16, 1908, page 1137.) These reductions have cost the roads over \$8,000,000 a year, or almost 18 per cent. of their total revenue from the mail business. Joseph Stewart, Second Assistant Postmaster General, in his recent annual report, alludes to heavy reductions that lately have been made in the railway mail service, saying that some of the most important fast mail trains in the country have been canceled. These curtailments of service have been mainly due to the cuts made by the government in the pay of the railways.

Contrary to the popular idea, the mail business usually has not been very profitable. The roads have competed for it because when a railway is built and in operation its fixed charges and the great bulk of its expenses go on whether it earns much or little, and it will seek and take some business at a rate which, if applied to all its business, would be entirely unremunerative. But if the return from any part of the business is reduced below the expense that is directly incurred in handling it, the roads will either raise the rates on it, reduce the service given to handle it, or abandon it. They cannot raise the rates for hauling the mail, because they are fixed by Congress. They can hardly abandon the mail business. But in order to reduce expenses they can curtail the number and lengthen the schedules of the trains on which they carry mail, for the government is as powerless as any individual constitutionally to force them to serve it at a loss. And this is what they have done and are still doing. Legislation providing for annual weighing without any reduction in present mail rates would not only tend to correct inequities as between the various roads, but would also tend to increase the aggregate amount paid them; and the latter result seems as desirable as the former, for recent events indicate that the railway mail service, which is the foundation of the entire postal service, will deteriorate when it ought to be improving if Congress does not put the compensation of the railways on a less unprofitable basis.

NEW PUBLICATIONS.

Aberle's Railroad, Financial, Commercial and Statistical Wall Map of the United States and of parts of Canada and Mexico. 64 x 42-in. Cloth back. Designed by Edward Aberle, Nutley, N. J., Geographer and Engraver. Published by Brett Lithographing Co., 605 W. 129th street, New York. Price, \$15.

The principal value of this excellent map lies in the clearness with which it shows the railway systems of the country, carefully differentiated in colors. It is the best wall railway map of the United States, Canada and part of Mexico which we have seen.

Directory to the Iron and Steel Works of the United States—Canadian Supplement. Compiled and published by the American Iron and Steel Association, Philadelphia. 19 pages: 5¼ x 8½ in.


This supplement to the Iron and Steel Directory gives a complete list of the blast furnaces, rolling mills and steel works in Canada, corrected to December 1, 1908. It is arranged in the same form as the rest of the directory, the works being grouped geographically, and the history, equipment, capacity, officers, etc., given. The plants included are those now active, or those that may possibly be active at some future time. There is also a summary giving the number, class and capacity of each kind of plant as compared with four years ago. There are now 15 completed blast furnaces, one rebuilding and two projected, the total capacity being something over 1,000,000 tons of pig iron. There are 26 completed rolling mills and steel works, and one to be rebuilt, the capacity being 200,000 tons of Bessemer steel and 700,000 tons of open hearth steel ingots and castings, while the total finished rolled and forge products, not including blooms, sheet bars, etc., is 1,000,000 tons.

Letters to the Editor.

THE CENTENARY OF RAILROAD TRAVEL.

London, November 18, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Allow me to correct one or two misprints in the above article in your edition of Nov. 6. On line 7, column 1, the tram-plates should be shown as , and the engine should be dated 1808, not 1803. It is now known pretty certainly that Trevithick's first engine, that of 1803, had a single horizontal cylinder and spur gearing.

On line 9, column 2, the date 1908 should obviously be 1808.

W. B. PALEY.

THE COST AND PROFIT OF IMPROVEMENTS.

Baltimore, Md., November 6, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The editorial entitled "A Revived Compound" in your issue of the 6th inst. says that locomotive practice in the United States is governed more by the performance of employees running the engines than by the influence of good engineering—this with special reference to the careful attention which Vaucrain compounds have apparently received on the Chicago, Milwaukee & St. Paul Railroad and to the slow growth in the adoption of the superheater on locomotives.

It is noted Mr. Vaughan, of the Canadian Pacific Railway, says in reference to the superheater that its success "is a question of attention and not extra expense for maintenance." The only logical conclusion from Mr. Vaughan's statement is that where the superheater is not a success roundhouse machinists and foremen are loafing; otherwise how would Mr. Vaughan propose to secure the time necessary to give attention to the superheater without extra expense.

It is no doubt the opinion of most mechanical officers of railroads that the simplest mechanism in locomotives is preferable, to use the language in another part of your editorial, and no doubt departure from this principle in the direction

of compound locomotives and superheaters is largely influenced by the price of fuel. The mechanical officers of railroads which pay \$3 or \$4 for coal on tenders would be warranted in adopting devices which the mechanical officers of railroads which pay from \$1 to \$1.50 for fuel would frown upon as uneconomical.

When you say "the saving in damage to track has not been regarded as of sufficient importance to warrant the higher initial cost and additional trouble of maintenance" you express the situation exactly. It is simply a question of balancing one expense against another.

M. B. WILD,
Statistician, Baltimore & Ohio.

THE "RUN LATE" ORDER ON SINGLE TRACK.

Boston & Maine Railroad—Eastern Division,
Boston, October 26, 1908.)

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

I have read Mr. Graeff's remarks, in condemnation of the run late order, in last week's issue of the *Gazette*, and it seems to me that many dispatchers will protest. If the protests do not appear, it is not because dispatchers in general agree with Mr. Graeff, but either because they have not seen the article or else consider his argument too biased—in view of his recommendation of the A. B. C. rules—to merit a reply.

Surely Mr. Graeff is not speaking from experience as a train dispatcher; or can it be that he has allowed his desire for the adoption of the A. B. C. rules to influence his better judgment?

In any case his contention for the abolition of the run late order, and the substituting of a straight meet, is not only impracticable, but it is doubtful if any railroad management in the country would countenance the use of straight meets between trains of different classes. Railroads advertise on the records of their passenger trains, not on that of their freights, and as a train dispatcher is expected to despatch, not detain, trains, it behooves him to use every possible resource to keep trains on time; this not only for the financial interest which the company has in it, but for a little personal (and pardonable) pride in his work.

Mr. Graeff says: "If a meet order had been issued the conditions which caused the collisions would not have existed." Maybe not; we do not know what the conditions which did exist were. But it is safe to say that the use of the run late order was in no way responsible for the collisions. A trainman who will forget a run late order will forget a meet order. On single track, the first thought of a trainman when he receives a run late order on an opposing superior class train is, "where can we go for 'em?" and before he turns a wheel he knows that, barring accidents or other unforeseen delays, he will make a certain point.

Mr. Graeff goes on: "Where there are blind sidings between telegraph offices a direct meet is preferable. If the inferior train meets with delay, the run late order becomes restrictive because of the necessity of flag protection." Say, for instance, A and D are two telegraph offices, with two blind sidings, B and C, between. No 1 (inferior) is running from A to D, with a meet at C on No. 2 (superior), which is late; No. 1 passes B all right, but gets delayed a mile beyond, and is still five or six miles from C. Would it not have been more advisable to give No. 1 a run late in this case, and avoid delay to the superior train? It is to be remembered, of course, that this is superiority by class, not by direction; a passenger and a freight, or a fast freight and a "drag."

Again, if the freight or inferior train meets with delay, whether on a meet or run late, would the fact that the superior train was on time, and the inferior train had no orders against it, render the inferior train immune from accident, and the superior train from delay thereby? Several cases might be cited of this, but they are not necessary.

It the time should come when railroad managers want straight meets between all opposing trains, dispatching cir-

cuits would have to be materially reduced to enable dispatchers to keep the necessary watch on all trains and keep them moving without delay, for it is a physical impossibility for one man to do so on the ordinary division of 100 to 130 miles of line.

Answering frankly, as Mr. Graeff requests, why train dispatchers use the run late, instead of a meet, I would say it is the most logical order to use when moving trains under the conditions to which it applies. It covers every affected train on the road, with hardly any more work and attention than is required for one train. Oftentimes a dispatcher has to rely on information received by wire from another dispatcher, perhaps 100 miles away, as to how late a train is running. What dispatcher would expect to get the correct figures to the minute? Even if given, would any dispatcher feel justified in "putting out" every minute of the time? Can meets be figured on this basis? If a dispatcher does put out meets on the information he receives, and if traffic is at all active, how much time does he lose watching every move of the inferior train? If there should happen to be four or five inferior trains, all looking for meets, what kind of a situation would that dispatcher have about the time the superior train was due on the late time?

The freight trainmen are not yet prepared for their millennium, neither are the railroads prepared to give it to them.

M. J. MEEHAN.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

On single track the use of the run late order would appear to be about the only way to move fast freights of important passenger trains. I do not see how trains could be handled otherwise, unless by the "schedule order," which has some bad features.

Take the case of a dispatcher who has a fast passenger train about two hours late and has 15 trains on his district that will need time against the passenger train. May be not one of these trains is ready to move at the time the passenger train is given the order. The dispatcher has no way to get another order to this passenger train after it leaves the terminal without stopping it and causing a delay, which would not be practicable. Five of these inferior trains are trains which are doing work at different stations, another five have not reported for orders at the terminal and the balance are work trains which are at liberty to move in either direction. This is a fair example of the number of trains ordinarily on a single-track line of 100 to 150 miles. The men on a freight train of 50 cars can tell what they can do, and how far they can go to meet a passenger train and clear it a specified time better than a dispatcher can, as they are right on the ground and know the condition of their engine, the chances for delay, the condition of the rail and other circumstances. A train running down a long grade has more or less trouble with hot boxes; going up hill it meets with difficulties with regard to water and coal, dirty boilers, inexperienced firemen, front ends filling up and other things.

If a local or through passenger train is started out late with meeting points with 10 or 12 trains, it is certain that a large percentage of these orders will have to be changed. This requires the conductor to be alert at all stations to be on the ground to sign orders, or to receive them in the case of a "19" order. While it might help the opposing trains in simplifying their part of it, it does not appear to afford any help to the passenger train.

Even if a dispatcher could figure exactly for all of his opposing trains, it must be taken into consideration that these trains without a doubt would have meeting points with other trains going in the same direction as the train that is being run late, thus doubling the chances that delays will arise that cannot be anticipated.

Of course the run late orders should be issued with regard to a time that can easily be added to the card time. The

times should end in "0" as, for example, 20 minutes or 30 minutes.

Where a train running against a train which is late has only one station to go, it would save a possible delay by flagging, in case it is delayed, if the trains were given a meeting point.

From a train despatcher's standpoint, I am at loss to see where it would better the service to abolish the run late order. From a conductor's standpoint the increase in meet orders would mean an additional delay stopping to register with trains where there would be no delay at all with the order running a train late.

FRANK C. DOW.

Canadian Pacific Railway Co.,
Montreal, November 5, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Referring to Mr. Graeff's letter in your issue of Oct. 23 concerning the use of "run late" orders on single track, I am inclined to take the opposite view. Where there are blind sidings between telegraph offices my experience has been that in such cases the "run late" order is preferable, otherwise serious delays occur to important fast freight trains. Under such conditions to instruct a despatcher to make use of straight meet orders as between fast freight and drag trains is to court delays and invite adverse criticism of his work, whereas time orders properly handled allow the "fast" to keep moving and provides all that the "slow" requires. Under the conditions which exist in the working of Mr. Beamer's A B C rules, there would, of course, be no necessity for "run late" orders, as the despatcher controls each block; but under the standard code rules, even with an operator at every siding night and day, I am satisfied that the "run late" fulfills the requirements, as cases are rare in which delays occur making it necessary to flag ahead in order to reach a given point. The same care must be exercised in the handling of these "late" orders as any other train orders, and barring engine failures between sidings the "slow" must stay back for the "fast" or important freight trains cannot receive the required despatch.

G. T. ROOKE,
Inspector Train Despatching.

Contributed Papers.

THE ROADMASTERS' CONVENTION.

II.

In addition to the proceedings recently reported in the *Railroad Age Gazette*:

F. A. Smith (*Roadmaster and Foreman*) read a paper on "Railway Curves from a Practical Point of View."

E. E. R. Tratman read a paper on "Railway Maintenance of Way." Following a detailed description and discussion of track and the various conditions to be met in the proper maintenance of the same, he said:

With such continual and important work, it might be thought that a force of specially trained and skilled men would be permanently employed. But this is not the case, and the failure to do this is one of the weak points in the system of railroad management. In the eyes of many managements any unskilled laborer is sufficient for track work, and after a little pick-and-shovel experience, may be eligible for a foreman. How is such a man to be expected to drill a rail properly and without damaging the machine, to properly bolt up a joint in hot or cold weather, to tamp a tie firmly without making it center bound, or to be of any real use in putting in a switch? The man has to pick up his knowledge as best he can; some of it is right and some of it is wrong. The company pays for it in damaged tools and ineffective work. Even if he tries hard to make himself ef-

ficient and competent he does not advance himself much. The pay is poor and his efficiency receives little recognition. He is liable to be discharged at any time when work is slack, and to see an unskilled man employed in his place when help is again needed. There is not the slightest doubt that the track or maintenance-of-way forces should have the same recognition and consideration as the shop men, enginemen and trainmen.

The problem of getting and maintaining section men and section foremen has been discussed at former meetings, and it is a very serious and practical problem for the man in charge of the work of maintenance of way. Only a short time ago I saw a foreman who had been given a gang of foreigners to do some ditching. They had been given shovels and shown where to work. They found a number of stumps in the trench and were slowly and laboriously digging and chopping at them when the foreman came along. He told them to use picks, but not one understood him, so they all stopped work to look at him while he talked. Then he made motions as if using a pick, but they all shook their heads and grinned, until one smart man picked up a sledge and offered it to the foreman. Finally he had to go to another gang to find a man who knew a little English and sent him off for some picks. The men would be good and willing workmen, no doubt, after a little experience and training. But they would have no chance to learn, being sent off to some different job when this was finished.

Sometimes one smart man in a section gang is promoted to be foreman. He may do very well on open track and tangents; but how can he be expected to do good work in lining a curve, checking its elevation or putting in a switch and turnout? Poor work is likely to result for the reason that the man has never been trained and instructed but has simply picked up his knowledge by what may be called "trial and error." He does the best he can, and sometimes he does very well. In fact, the roadmaster may congratulate himself upon the skill and care of his foremen, who are the men who carry out his orders. Not every section man is competent to be a foreman, and there is always trouble in keeping up the supply. Some roads have special gangs for the training of foremen, and this is a wise policy.

One difficulty with the untrained man, when promoted from laborer to foreman, is his lack of ability to regulate his work, to keep his entire section in mind, and to work his men to advantage. He is apt to work here and there on small jobs, instead of caring for the section as a whole. * * *

One good way to forward the education of the foreman is to let him see what other foremen are doing. If he lives continually on his own little section he has nothing with which to compare his own work and methods. It is to be wished that more railroads would follow the practice of holding an annual inspection of track, and taking all the foremen of a division over the entire division so that they may see what other men are doing. The roadmaster has a wider field, but it is good for him to get off his division occasionally to see what other roads and other roadmasters are doing. * * *

And now about the roadmaster, who is at the head of the track forces. He has charge of the maintenance of 100 to 150 miles of road, and has under him a regiment of men divided into small companies or section gangs, each in charge of a foreman who is directly responsible to the roadmaster, and for whom the roadmaster is responsible. Besides a thorough knowledge of the general work of track maintenance, the roadmaster should be familiar with the principles of grades and curves as affecting the operation of the road, the principles of curve layouts and yard design, the problems relating to ties and tie preservation, the relation of rail sections to wear of rails and wheels, and other matters of a similar character. He is responsible for the maintenance of the track on his division, and for keeping everything pertaining to the roadway in safe and proper condition for the traffic. He must spend much of his time on the road, inspecting its

condition and seeing that the maintenance work is being done properly. He must be thoroughly posted as to the condition of his entire division, and the distribution of the work and forces. Track, fences, track signs, mail cranes, buildings, water supply, new material, and all the general supplies and work are under his direction. He must study methods of work also, and see that all work is done in such a way as to give the best results. He has also to study and report upon tests of new materials and devices or new standards. He must see that the section gangs are equipped with the proper tools, time books and report blanks, and that the tools are used properly and reports made properly. He must spend sufficient time at his office to check over the reports made to him, and to prepare his own regular or special reports to the superior officers.

A report on "Proper Care of Track Material and Tools" gave advice regarding the piling along the right-of-way of treated and untreated track ties, of switch ties and head blocks, crossing plank and fence lumber, and rails; also as to the keeping and distributing supplies of switch material, rail and joint fastenings, emergency rail and tools, and the collection of scrap. Concerning tools the report said:

Each section should be supplied with a sufficient number of first-class tools, the very best that money can buy, as there is no greater waste of money than for a section crew to work with inferior tools. The number of pieces of each kind would be governed by the number of men in each crew. In addition, each section should have a few extra tools for use in case of emergency, but no more than absolutely necessary to properly care for the work. A monthly inventory of all tools on a section should be rendered by the section foreman. In general, for ordinary repair work, the foreman should make his requisition on the roadmaster for tools and material once every 30 days and the foreman should be furnished with a small surplus of tools and material blank on which he should enter all tools on his section which will not be used for the next 30 days; this blank should be pinned to his monthly requisition and forwarded to the roadmaster at the close of each month. This will enable the roadmaster to transfer tools and material from one section to another and thereby avoid making requisition for supplies which he has on his division available for use. A great deal of money can be saved each month by having a system of this kind or a similar one. All tools, as soon as they become dull or out of repair so they will not do first-class work, should immediately be sent to the shops for repairs and they should be put in good shape and returned to the section from whence they came, without delay.

The hand car for a section crew should be the very best that can be obtained. It should be light as possible but sufficiently strong to carry six or eight men and the necessary outfit of tools. There is no greater waste of money than to have a section crew running a poor hand car; 30 minutes in the morning and 30 minutes in the evening, day after day, on account of a poor hand car, runs into money very fast. The foreman should give his hand car very close attention; he should inspect it every morning before going to work and see that all bolts are securely fastened and that all bearings are clean and well oiled.

Track tools of all kinds should never be used for any other purpose than that for which they are made. Track shovels should never be permitted to be used in holding up the end of ties while tamping, in pulling ties out of track or putting in new ones; nor should they be used for spacing ties in the track. Claw bars should not be forced under the head of a spike by hammering the heel with a spike maul; sufficient wood from around the head of the spike should be cut with an adz or sharp pick to permit the claw bar to grasp the spike head. Nor should they be used between the tie and rail to lift the rail. This will break the claw in a great many cases, especially in cold weather.

Lanterns should always be kept in first-class condition, ready

for an emergency call, except that they should not be left standing or hanging up in the tool house with the cup filled with oil, as this will spoil the oil and rot the wick.

When through with the day's work, all tools should be conveyed to the tool house and locked up for the night. Track gages and track levels should be tested frequently to ascertain if they are true and correct.

FOOTBALL TRAFFIC ON THE NEW HAVEN ROAD.

The tables appearing below showing football traffic on the New York, New Haven & Hartford Company's lines on November 21, 1908, the day of the Yale-Harvard football game, as compared with the same game two years before, have this year, besides their fullness, some special points of interest. Practically all the trains ran through on time and the great and concentrated traffic on a system of high passenger density in its normal business was handled with complete success and without accident. The receipts for the day were from the football traffic \$71,299. The normal passenger traffic per day, Sundays included, was during the last fiscal year \$63,014, the football traffic alone thus exceeding by \$8,285 the normal daily passenger receipts on the company's whole system of 2,047 miles with 4,332 single track miles. But to the football return of \$71,299 important additions are evidently to be made. It does not include much of the increased football traffic on the day before and the day after the game, nor the immense increase of the corporation's trolley business, the New Haven city trolley system alone carrying 135,000 on the day of the game, besides the increment of business on the outlying and connecting trolley lines running to the cities of Waterbury, Ansonia, Derby and Meriden and a number of large suburban towns.

On the day of the game the great increase of visitors coming by automobile was very marked as compared with the Yale-Harvard game of 1906. It was estimated roughly that there were 1,000 automobiles parked outside the field representing probably nearly 4,000 persons who a few years ago would have come by rail. Yet the rail passengers decreased only by 1,677, while the receipts increased by \$8,398. This, however, was because this year an uncommonly large proportion of the tickets to the game were sold outside of New Haven, especially at Boston, the Boston business increasing by 996 passengers and \$3,455 in revenue.

The more important features of the traffic appear in the tables annexed, the distance between New Haven and New York (Grand Central Station) being 73.21 miles, and via Providence between New Haven and Boston (South Station) 159.03 miles:

YALE-HARVARD FOOTBALL GAME SERVICE, NOVEMBER 21ST, 1908.

Trains from New York to New Haven.

Train.	Left New York.	Arrived New Haven.	Cars in train.	Passengers.
72	1:05 a.m.	2:59 a.m.	6	18
2	12:01 "	2:20 "	13	28
270	4:49 "	7:25 "	8	190
274	6:45 "	9:30 "	4	145
YA	7:55 "	9:55 "	12	544
46	8:01 "	10:02 "	12	457
YB	9:04 "	10:56 "	12	830
50	9:16 "	11:10 "	12	595
YC	9:20 "	11:13 "	12	776
YD	9:25 "	11:18 "	10	465
YE	9:35 "	11:23 "	10	309
1/10	10:08 "	11:43 "	7	151
YF	9:45 "	11:47 "	10	281
YG	9:50 "	11:41 "	12	838
YA	11:33 "	11:55 "	12	377*
12	10:11 "	12:07 p.m.	12	398
2/10	10:05 "	12:05 "	10	247
YH	10:13 "	12:26 "	12	868
YI	10:20 "	12:16 "	12	497
YJ	10:22 "	12:20 "	10	313
YK	10:30 "	12:29 "	10	291
YL	10:30 "	12:42 "	10	304
278	10:06 "	12:58 "	6	130
YM	10:43 "	12:48 "	12	840
YN	10:55 "	12:54 "	12	333
52	11:01 "	12:59 "	12	260
54	12:01 p.m.	1:54 "	12	295
Total			282	10,780

* From Bridgeport.

Trains from New Haven to New York.

Train.	Left New Haven.	Arrived New York.	Cars in train.	Passengers.
YA	4:26 p.m.	6:12 p.m.	12	707
YB	4:35 "	6:30 "	12	426
287	4:37 "	7:48 "	6	250
YC	4:58 "	7:12 "	12	1,161
17	5:21 "	7:27 "	11	683
YG	5:08 "	7:00 "	12	958
YD	5:23 "	7:17 "	10	524
YE	5:30 "	7:36 "	10	287
YF	5:40 "	7:44 "	10	297
YH	5:34 "	7:53 "	12	908
289	5:53 "	9:19 "	10	433
YJ	5:56 "	7:57 "	10	334
YK	5:59 "	8:00 "	10	300
YL	6:10 "	8:16 "	10	264
YI	6:03 "	8:30 "	12	916
55	6:19 "	8:40 "	12	300
2/10	6:30 "	8:30 "	10	231
21	6:56 "	8:50 "	11	416
57	7:12 "	9:11 "	8	408 ^{11/2}
59	8:03 "	9:57 "	12	367
23	8:18 "	10:12 "	5	10
25	9:15 "	11:18 "	12	423
Total			229	10,614

Trains from Boston to New Haven via Hartford.

Train.	Left Boston.	Arrived New Haven.	Cars in train.	Passengers.
HA	8:00 a.m.	11:56 a.m.	8	450
2/45	8:01 "	12:24 p.m.	8	559
HB	8:30 "	12:30 "	7	515
HC	8:35 "	12:50 "	7	546
Total			30	2,070

Trains from New Haven to Boston via Hartford.

Train.	Left New Haven.	Arrived Boston.	Cars in train.	Passengers.
HB	4:55 p.m.	8:32 p.m.	7	400
HC	5:03 "	8:57 "	7	431
HA	5:28 "	10:17 "	8	410
Total			22	1,241

Trains from Boston to New Haven via B. & A. and Springfield.

Train.	Left Boston.	Arrived New Haven.	Cars in train.	Passengers.	Left Springfield.
AA	8:15 a.m.	12:15 p.m.	10	361	10:41 a.m.
AB	8:25 "	12:34 "	10	277	10:51 "
AC	8:27 "	12:43 "	6	161	10:56 "
Total			26	799	

Trains from New Haven to Boston via Springfield and B. & A.

Train.	Left New Haven.	Arrived Boston.	Cars in train.	Passengers.
AA	5:27 p.m.	9:40 p.m.	10	410
AB	5:40 "	10:10 "	10	305
AC	5:44 "	10:25 "	6	163
AD	B.Dk 1:00 a.m.	5:33 a.m.	6	105
Total			32	983

Trains from Boston to New Haven.

Train.	Left Boston.	Arrived New Haven.	Cars in train.	Passengers.
1	12:06 a.m.	5:14 a.m.	12	62
653	6:25 "	7:40 "	4	149*
659	7:35 "	9:28 "	6	259†
61	9:04 "	1:08 p.m.	12	120
635	6:35 "	11:52 a.m.	5	94
BA	8:05 "	12:00 noon	10	325
BB	8:10 "	12:10 p.m.	10	406
BC	8:15 "	12:25 "	10	261
BD	8:20 "	12:27 "	10	254
BE	8:25 "	12:42 "	10	257
BF	8:38 "	12:54 "	12	848
BG	8:46 "	2:23 "	12	198 ⁺
X	9:55 "	11:50 "	10	117
9	10:00 "	1:22 p.m.	6	25
11	10:03 "	2:05 "	8	71†
661	12:03 p.m.	2:00 "	4	
Total			141	3,446

* From Saybrook Junction.

† From New London.

‡ Train of D. H. cars.

Trains from New Haven to Boston.

Train.	Left New Haven.	Arrived Boston.	Cars in train.	Passengers.
62	4:20 p.m.	8:27 p.m.	6	55
22	5:05 "	8:54 "	10	296
BA	5:10 "	9:08 "	10	320
BB	5:12 "	9:20 "	10	388
BC	5:22 "	9:30 "	10	306
BD	5:25 "	9:40 "	10	254
666	5:25 "	8:35 "	7	280*
BH	B.Dk 5:45 "	9:43 "	6	109
BF	5:43 "	10:45 "	12	882
668	6:25 "	8:05 "	4	82†
24	6:48 "	10:12 "	7	159
BE	6:51 "	10:50 "	10	266
26	7:09 "	11:16 "	12	494
2	2:33 a.m.	7:01 a.m.	12	260
72	2:56 "	8:04 "	9	2
Total			135	4,153

* To New London.

† To Saybrook.

Besides the foregoing there were a total of 14 trains between New Haven and Springfield (both ways) carrying a total of 5,354 passengers on an average of approximately 382 passengers per train including one train of 12 cars carrying 820 passengers and another after the game carrying 912 passengers. Three local trains on the Northampton and Western division carried respectively 450, 350 and 37 passengers. The summaries for passengers and revenue follow:

RECAPITULATION.
Into New Haven.

	No. of Trains	No. of cars.	Passengers.
New York to New Haven	27	282	10,780
Boston to New Haven, via Hartford	4	50	2,070
Boston to New Haven, via Springfield	3	26	799
Springfield to New Haven	6	56	2,318
Shelburne Falls to New Haven	3	11	590
Western Division trains into New Haven	5	22	902
Boston to New Haven, via Shore Line	16	141	3,446
Friday, special trains	2	12	217
Friday, special cars	..	4	93
Total	66	584	21,215

Out of New Haven.

	No. of Trains	No. of cars.	Passengers.
New Haven to New York	22	229	10,614
New Haven to Boston, via Hartford	3	22	1,241
New Haven to Boston, via Springfield	4	32	983
New Haven to Springfield	8	73	3,036
New Haven to Northampton	1	7	346
Western Division trains, out of New Haven	2	11	406
New Haven to Boston	15	135	4,153
Total	55	509	20,779

Statement Showing the Approximate Amount of Revenue Accruing Account of the Yale-Harvard Foot Ball Games at New Haven, November 21st, 1908, and November 24th, 1906.

	1908	1906	Increase
Special ticket business.	No. psgrs.*	No. psgrs.*	No. psgrs.*
New York	12,952	11,086	1,866
Boston.†	7,048	6,052	996
Boston.‡	1,534	1,876	342§
Providence	356	697	341
Springfield	592	740	148
Hartford	1,218	913	305
Bridgeport	1,214	1,670	456§
Other points	1,750	2,519	769§
Total	26,664	25,219	1,445
Excess, reg. business.	13,113	18,355	5,242
Total	39,777	43,574	3,797
Parlor & sleeping cars.			
New York	2,453	2,008	445
Boston†	3,743	2,842	901
Other points	2,569	2,227	342
Total	8,765	7,077	1,688
Grand total	39,777	41,454	1,677
	\$71,299	\$62,901	\$8,398

*One way.

†Via Shore and Hartford lines.

‡Via Springfield.

§Decrease.

The special pamphlet for instruction of operators of the road contains 38 large pages and diagrams relating to the day's service for the game, besides two smaller pamphlets for information and instruction. They include the following special instructions:

The schedules and times contained herein shall not be construed to confer track, running or time-table rights to any train. These trains will be run on train orders or as per General Instructions, Rule No. 1, Time-table 50.

Familiarize yourself with the time of all trains, both special and regular, and also with the special instructions contained herein.

The working limits of work trains must be restricted as necessary to absolutely prevent interference with passenger trains during the movement of football service.

Chief Dispatchers must see that freight trains clear all specials and first class trains at least twenty (20) minutes during the movement of football service.

Drawbridges must not be opened within fifteen (15) minutes in advance of any special or first-class train during the movement of football service, except in case of extreme necessity, and Chief Dispatchers shall see that Towermen are instructed accordingly.

Operators in block stations must use great care in plunging for the release of block, so that there will be no delays on account of signal failures, and must announce and clear up all trains clearly and promptly.

There will be a telegraph operator at Yalesville from 9 a. m. until 9 p. m. Saturday, November 21.

Telegraph offices at Windsor Locks and Thompsonville will remain open until after the last football special has passed.

Enginemen are cautioned to use care in approaching all congested terminals, particularly New Haven, Hartford and Springfield, and proceed only as the way is known to be clear.

Seven special orders also appear for the stationing of wrecking cars and two orders for emergency engines.

ELECTRIFICATION OF MELBOURNE SUBURBAN LINES.*

BY CHARLES H. MERZ, M.INST.C.E.

VII.

Assuming the use of direct current equipments capable of giving the acceleration determined on I have calculated the average energy consumption at the train to be 83.7 watt-hours per ton-mile, which figure includes due allowance for coach lighting, heating, control circuit and motor-driven compressor for supplying the power brakes, and irregularities in operation.

The accompanying table shows the total amount of energy required by the trains per annum, the calculated losses in the transmission and distribution systems, and the total output of the power station at each stage of the conversion; the maximum demand on the generating plant during the heaviest traffic corresponding to these outputs is also given in terms of electrical horse-power.

Total Energy Consumption for Traction Purposes.

Units per annum.	Port Melbourne and St. Kilda branches.	Stage I.	Stage II.	Stage III.
Consumption at train	3,100,000	16,990,000	32,800,000	51,000,000
Loss in track conductors, substations and transmission cables	780,000	4,410,000	9,600,000	17,000,000
Total units generated*.....	3,880,000	21,400,000	42,400,000	68,000,000
E. H. P. required from power station during heaviest half-hour	1,920	10,200	19,800	32,100

*For traction.

A reference to the general estimates will show that, according to my recommendations, the total cost of power, including interest charges, for working all the suburban lines electrically will amount to over £100,000 (\$500,000) per annum. The question, therefore, of the way in which this power should be obtained is a very important one. It has also an important bearing on the question of the size of scheme that can be economically proceeded with in the first instance.

I deal in this section with the supply of power to the suburban railway system and for the other purposes for which electric power is required by the Railway Department on the assumption that this will have to be considered and dealt with by itself as an individual problem. I also assume that the power will be derived from coal.

As it is frequently found that it pays better to buy power than to erect a special power station for railway purposes, I will first dispose of this alternative. There are only two power stations of any size in the neighborhood of Melbourne; the Corporation station, situated in Spencer street, and the station of the Electric Lighting & Traction Co. of Australia, situated at Richmond. Neither of these (nor any other station) is suitable for the production of power in sufficient quantities or at a low enough price for the working of the railways.

The essential conditions of any site for a power station producing energy from coal or other fuel by any method known to-day are:

- (1) A good foundation.
- (2) Good facilities for obtaining coal from various sources

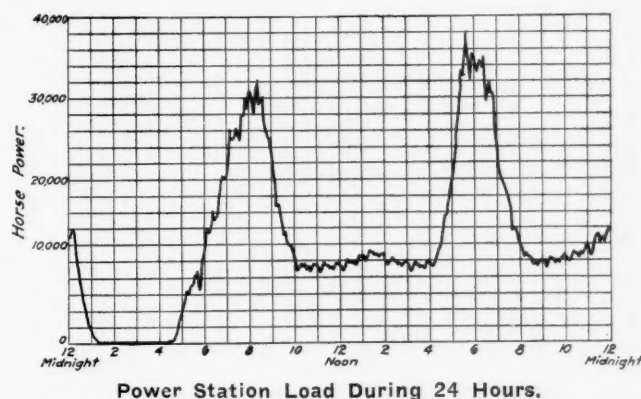
*Abstract of the Report to the Victorian Railways Commissioners on the application of Electric Traction to the Melbourne Suburban Railway System. Published by the courtesy of the commissioners.

and for bringing it to the power station, preferably both by water and by rail.

- (3) An ample supply of water.
- (4) Ample room for coal storage and for future extensions.
- (5) Unless inconsistent with the foregoing, the power station should be situated near to the electrical center of the system to be supplied with power.

Neither of the sites on which the two existing stations, referred to above, are built can be said to satisfy these conditions, apart from the fact that the existing plant and buildings would not be suitable for extension for the purposes of supplying the railways. This being so, it is necessary to consider obtaining the electrical power for working the railways from a new station or stations.

Other things being equal, the natural thing, as I have indicated, is to erect a power station as near as possible to the center of the system, which, in the case of Melbourne, happens to be close to the spot where New South Wales coal would naturally be most easily unloaded. As, however, the Victorian Black Coalfields and some of the Brown Coalfields are situated at some distance from the center of the system, the alternative is to erect a power station in close proximity to one or other of these coalfields with a view to saving the cost of carrying the fuel to Melbourne by rail—if this were done, the power would be transmitted electrically to Melbourne.



The majority of long-distance transmissions in the world are in connection with water power, in the case of which there is the great advantage that the entire cost of fuel is saved, and there is this large saving to be set against the interest charges on the capital cost of the transmission line and the development of the water power. When, however, it is a question of buying coal in any case, it is frequently stated as a general proposition, and usually found to be true, that it is cheaper to carry the coal than to spend capital on pole lines for transmitting the power electrically. This might be expected to be especially true in the case of the Victorian Railways, because the state, being owner of the railways, is obviously able to carry coal at the lowest possible price.

My calculations show that if the railways be dealt with by themselves, even for the whole scheme there is no gain worth the extra complication and cost in locating the power station away from the center of the system in order to save the cost of rail carriage on brown coal.

Every traction power station has to deal with variations of load, but a power station dealing with a supply such as that required for the Melbourne suburban service would have to deal with very large variations of load, both momentarily and at different times of the day. This will be the case for many years at any rate, if not always, whether the station supplies the requirements of the railways and their work-shops only, or also supplies power outside. The accompanying chart shows the load curve which the power station would have to deal with throughout the 24 hours with the service proposed for a typical week-day, supposing all the suburban railways were elec-

trified, i.e., Stage III. This curve is based on average readings over short periods; that is to say, momentary variations, which are liable to be very severe on such a system, are not taken into account. The load factor, which is the relation between the actual output in units and the possible output if the maximum load were maintained throughout the 24 hours, is 33 per cent.

Under these conditions it is obvious that a type of prime mover should be adopted which can economically deal with such large variations of load; that is, a prime mover which has a large over-load capacity beyond its normal or economical load. The functions of such a prime mover are exactly fulfilled by the steam turbine, and this is recognized to be the most efficient machine for producing power for such a load. Compared with the reciprocating steam engine, its steam consumption is less, it requires considerably less attendance, and its use represents a substantial saving in oil consumption and repairs. I can, from actual experience of both types of plant, speak of the great economy, both in capital cost and in the above respects, which results from the use of the steam turbine.

The largest power stations erected, both in Europe and America, during the last five years have been equipped with steam turbines, and have shown a considerable economy compared with stations not so equipped. I, myself, have had considerable experience of the use of large steam turbines, as the Carville power station on the Tyne was the first power station in England to use them. This station to-day contains eight 7,000-h.p. turbines, and is producing electric power as economically as, if not more economically than, any other station in the world.

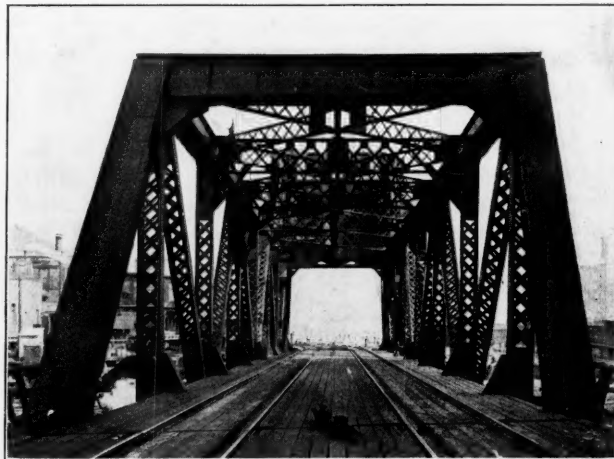
(To be continued.)

KINZIE STREET BASCULE BRIDGE OF THE CHICAGO & NORTH-WESTERN.

Wells street station, the Chicago passenger terminal of the Chicago & North-Western, is a short distance east of the north branch of the Chicago river. The entrance to this station for all trains of the North-Western has been over a riveted

Strauss design was adopted. This bridge, which is a double track, single leaf, trunnion type, was recently opened for service.

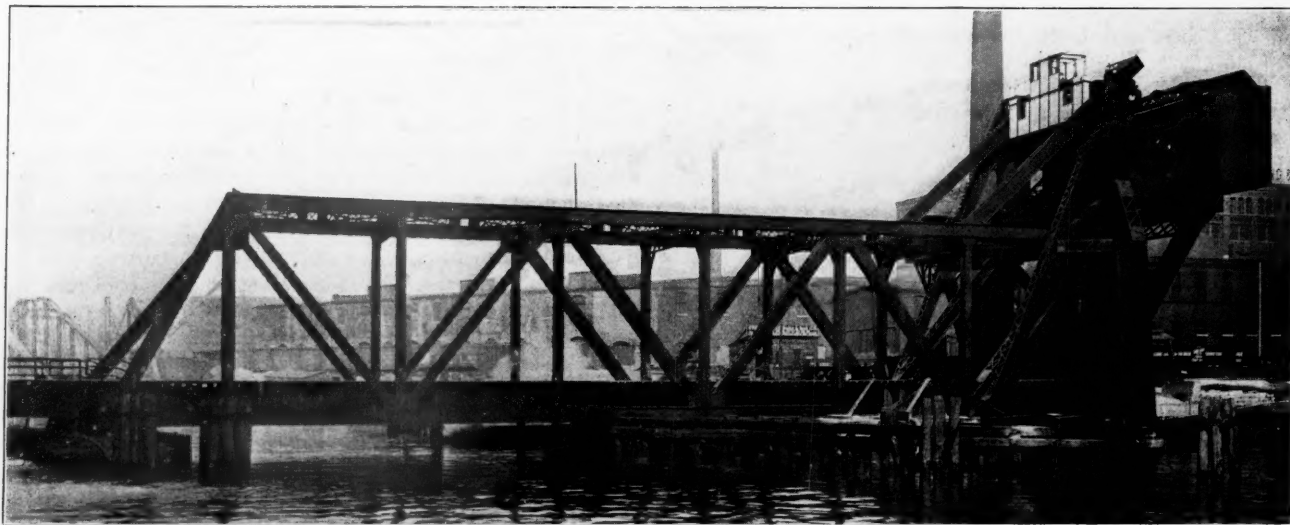
The new bridge was located on the south side of the old swing span with the trunnion pier on the east, or station, side of the river. To give space for building this pier a part of the east arm of the swing bridge had to be cut off to allow it to clear the new pier and bridge. The method of doing this, of counterweighting the shortened arm, and of putting in the



Portal View of Kinzie Street Bridge.

necessary temporary trestle work, etc., in the shortest possible time while traffic over the bridge was suspended, was described in the *Railway Age* September 6, 1907, page 323.

The trunnion pier of the bridge was carried down 115 ft. to bed rock, and was built by the pneumatic caisson process. The rest pier is founded on piles. The bridge itself is extremely compact in design. The large concrete counterweight, which weighs 1,200 tons, and has been painted black to harmonize with the rest of the structure, is pivotally connected to the tail end of the truss and is guided by the usual links



General View; Kinzie Street Bascule Bridge of the Chicago & North-Western.

lattice double track, swing span, known as Kinzie street bridge. In order to provide a 100 ft. clear channel in the river it became necessary about a year ago to replace this bridge with one of longer span. As all of the suburban trains of the North-Western, as well as the through trains, use this station, about 260 trains a day cross this bridge, exclusive of switching movements; and in season the river traffic causes on an average 1,000 movements of the bridge each month. These conditions could be served best by a bascule bridge, and the

forming the characteristic parallel motion of the Strauss design. The trunnions are located at the top chord and are 28 in. in diameter. The counterweight pins are 12 in. and the link pins 7 in.

The operating machinery is at the very top of the tower and is housed within a fireproof enclosure. The driving pinions operate two pin racks connected to the span at the first panel point ahead of the trunnions and a spur-gear equalizer synchronizes the movement of the two racks. The two motors are

50 h.p. each and have solenoid brakes. There is also a hand brake, and an automatic emergency brake which is both a hand and power brake. This brake is set automatically by the bridge itself when it reaches a certain limiting position.

The machinery is controlled from the operator's house, which is of reinforced concrete and is located at the level of the top chord of the leaf. The usual standard electrical equipment of controllers, switchboard, signals, etc., is provided. There are two independent sources of electric power, both 500 volt direct current, as well as a hand power and a pneumatic drive, these reserves being provided because of the great importance of keeping the bridge always in service. Despite the great size and weight of the leaf, it can be swung easily by the hand gear. The locking mechanism includes a front support for taking the live load off of the trunnions, and a truss lock at the rest pier end. These are driven by a 3-h.p. lock motor located at the center of the leaf, and the mechanism is such as to automatically cut out the motor when the parts reach

W. C. Curtis was resident engineer. The Great Lakes Dredging & Dock Co. built the substructure and the Toledo Massillon Bridge Co. was the general contractor for the superstructure, the erection being sublet to the Kelly-Atkinson Construction Co. The Strauss Bascul & Concrete Bridge Co. furnished the design and the general plans and specifications for the superstructure.

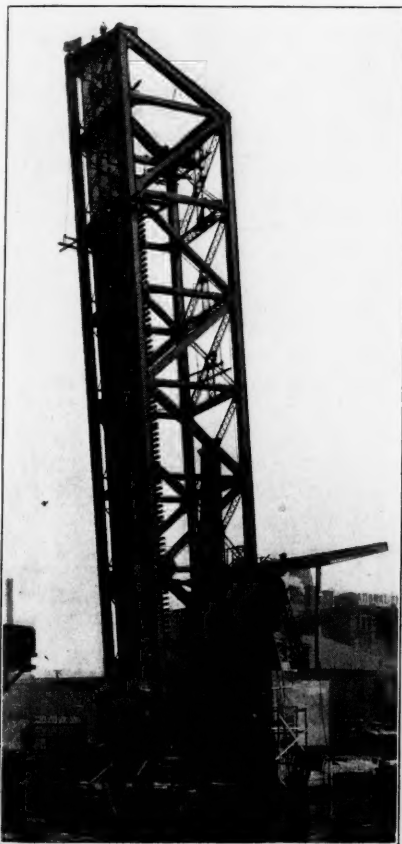
MR. HARRIMAN SUSTAINED IN REFUSAL TO ANSWER.

In the cases of Edward H. Harriman and Otto H. Kahn, the Supreme Court of the United States on Monday last held that the Interstate Commerce Commission is not entitled to press questions relative to private transactions, even though they involve dealings in the securities of interstate railways when the investigation of which such questions are a part has been begun upon the Commission's initiative. The opinion of the court was announced by Justice Holmes and dealt with the

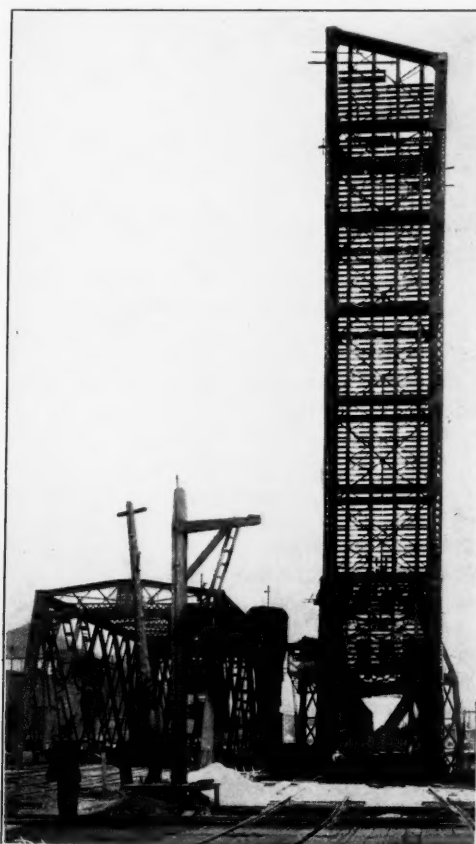
refusal of Messrs. Harriman and Kahn to make reply to questions put by the Commission in the course of an inquiry concerning the dealings of Mr. Harriman as president of the Union Pacific in the stocks of other railway companies, the inquiry being that on the "Alton deal" in 1906. Justice Holmes said that the Commission's inquiries should be confined to cases in which complaint had been made. He said that privacy should be properly regarded in proceedings begun by the Commission for its own purposes. The decision does not curtail the power of the Commission to compel the attendance and testimony of witnesses in cases where formal complaint of violation of law is concerned, but in the absence of such complaint the institution of such proceedings is held by the court to be without authority of law. The Federal Court at New York had ordered Harriman to answer the Commission's questions as to his ownership of 103,401 shares of preferred stock in the Chicago & Alton, purchased by the Union Pacific and deposited with Kuhn, Loeb & Co., under an agreement to sell at terms to be fixed by Messrs. Harriman, Stewart and Mitchell; also regarding his interest in other stocks. The opinion of the

court, after setting forth the circumstances leading up to the controversy, goes on to say that while many broad questions were discussed in the argument, the court confined itself to comparatively narrow ground. The Interstate Commerce Commission contended that it might make any investigation that it deemed proper, not merely to discover any facts tending to defeat the purposes of the Interstate Commerce Act, but to aid it in recommending any additional legislation relating to the regulation of commerce that it might conceive to be within the power of Congress to enact; that in such an investigation it had power, with the aid of the courts, to require any witness to answer any question that might have a bearing upon any part of what it had in mind.

As to the power of Congress, Justice Holmes says that whatever it might be there was no attempt in the Interstate Commerce Act to do more than to regulate the interstate business of common carriers, and the primary purpose for which the commission was established was to enforce the regulations



Side View of Kinzie Street Bridge.



Kinzie Street Bridge During Construction, Old Swing Span on Left.

their operative positions. The rail joints are mitred and are self locking.

When the new bridge was ready and was lowered into service the old one was floated off to one side and dismantled. Except for the interruption to rail traffic mentioned at the outset, and a few hours interruption to river traffic during the flotation of the old bridge, traffic was maintained without hindrance on both railroad and river throughout the work. The bridge has been in service for several weeks and is giving entire satisfaction. It takes about 45 h.p. and one minute of time to operate it. The design provides for a duplicate structure to be built adjacent to the present bridge within five years.

The work was done under the direction of E. C. Carter, chief engineer of the Chicago & North-Western, W. H. Finley, assistant chief engineer, having general charge of the work in the office and field. The plans of the substructure were made under the direction of I. F. Stern, engineer of bridges.

which Congress had imposed. By Section 12 of the act the commission was given authority to inquire into the management of the business of all common carriers subject to the provisions of the act. Justice Holmes continues:

We are of opinion that the purposes of the act for which the commission may exact evidence embrace only complaints for violation of the act and investigation by the commission upon matters that might have been made the subject of complaint. The main purpose of the act was to regulate the interstate business of carriers and the secondary purpose, that for which the commission was established, was to enforce the regulations enacted. In other words, the power to require testimony is limited as it usually is in English-speaking countries, at least, to cases where the sacrifice of privacy is necessary—those where the investigations concern a specific breach of the law. The power claimed by the Commission to summon witnesses anywhere from Texas to Maine was declared by the court to be autocratic, and greater than that possessed by any commission or court.

Justice Day for himself and Justices Harlan and McKenna delivered a dissenting opinion in which they took the ground that the majority's construction of the Interstate Commerce law was too narrow. Justice Harlan went even further and held that all of the Commission's questions should have received responses. Justice Moody did not participate in the case.

THE ABUSE OF THE MASTER CAR BUILDERS' ASSOCIATION REPAIR CARD.*

BY J. J. HENNESSEY,
Master Car Builder, C. M. & St. P.

At its annual convention of 1896, the Master Car Builders' Association incorporated into the Master Car Builders' Rules of Interchange, effective September 1, 1896, the following:

SECTION 16—Rule 4.—When repairs of any kind are made on foreign cars, a repair card shall be securely attached to outside face of intermediate sill between cross tie timbers. This card shall specify fully the repairs made, reasons for same, date and place where made and name of road making repairs, etc., etc.

This requirement has remained in the Rules of Interchange every year since 1896, and is still required under rule 76 of the present code. In revising the Master Car Builders' Rules of Interchange September 1, 1897, and since that time down to the present day (excluding the exceptions noted in last line of rule 4), intermediate or delivering lines were relieved from responsibility of wrong repairs not made by them. (See 1908 code, 2nd paragraph, page 2; rule 4, page 4; rule 47, page 19; and last sentence of rule 86, page 38.) The 1897 amendment referred to rendered the use of the Master Car Builders' repair card all the more necessary, as, in relieving the intermediate or delivering roads from responsibility of wrong repairs not made by them, it "boiled down" so to speak, the matter of adjustment to two parties only, viz.: the car owner and the road who actually made the wrong repairs. If, as required by the Master Car Builders' rules, the road which did the incorrect work applied a Master Car Builders' repair card covering the items objected to, its identity would of course be immediately known, and the adjustment of the account would then be a very easy matter. The application of the repair card in all cases of repairs to foreign car equipment as required by the Master Car Builders' rules, is not, I am very sorry to state, being done, and the fact that these repair cards are not being applied, brings to us a very difficult problem for solution. The road with which I am connected has cases coming up every day where our cars are offered home to us with wrong repairs to sills, trucks, draft gear, and other very expensive parts of our equipment, and the expense of correcting same is enormous, and we cannot afford to bear it. The repair card is invariably missing, and we are then forced to the only other method of ascertaining by whom the repairs

were made, and this leads us to that same old story of tracing with its attendant voluminous correspondence, loss of time, and expense, to say nothing of the burden placed upon the office forces of our motive power and car accounting departments. This difficulty has been growing worse from year to year, until now it presents to us a very serious condition with no apparent relief in sight. It is to be deplored that this particular rule is so flagrantly violated. Here we are, an association of master car builders, organized for the purpose of concerted action in various lines, the most important of which is the successful interchange of freight cars. To thoroughly understand each other in the workings of this particular branch of the business, we have agreed upon a code of rules, the carrying out of which necessarily means that railways must be honest, otherwise the plan would be a complete failure. In the regular course of business our cars drift hundreds of miles from home and we have to depend upon the honesty of the foreign lines in the matter of repairs and the rendering of bills. There are instances without number, where foreign roads have noted upon their repair cards that wheels were renewed account of sliding, axles renewed account cut journals, air hose renewed account missing, and numerous other parts repaired or renewed, for which the possessing road assumes the expense of such repairs account of the manner in which the defects were brought about. If the foreign lines were dishonest they could have reported such defects as the result of ordinary wear and tear and rendered bills for the work. It would not, therefore, be consistent for us to assign dishonesty as the cause of non-application of the repair card when repairs are made to foreign cars. My personal opinion is that it is due to indifference on the part of our repairmen. I have heard it said that the application of the repair card is not really necessary in view of the fact that the stub of such card reaches the car owner with the repair bill, or when sent through the mails in case no bill is rendered. This we all know is a grave mistake, as it is necessary to know immediately when car reaches home, where the incorrect repairs were made in order to avoid the objectionable tracing. It has also been stated that insufficient time is given to execute and apply repair cards when making up trains or when trains stop for only a brief period at repair points. I have looked into this and found that by having repair cards dated and signed, it requires only a trifle more additional time to fill in the other necessary data and apply the card, as it means only minor repairs such as air hose, journal bearings, brakes shoes and the like. I am therefore satisfied that this objection can be overcome if only an effort is made. The road with which I am engaged has what we term a traveling inspector, who is continually traveling over our system. It has been made part of his duties to look over foreign cars taken off our various repair tracks; also such foreign cars as receive minor repairs in the yards. If he finds any repairs made to such cars and no repair card attached covering the items, he makes report to headquarters and also to the foreman in charge at the local point, and the party at fault is easily located and disciplined. Headquarters also censure the foreman for allowing such violation, so that there is considerable incentive for the foremen to be vigilant in this regard. We have found this to be productive of very good results, and we have also found that the mere issuance of an order to apply repair cards in all cases of foreign car repairs, does not bring about the desired result; there must be something done to show that you mean to have the order obeyed. If our practice in this matter can be improved upon (and I believe there is always room for improvement), I sincerely hope the discussion here will bring it to light and give us all the benefit of whatever profitable ideas will be advanced. I also believe that the universal suffering among railways and private lines due to the non-application of repair cards, makes the subject one that should be taken up by all the railway clubs in the country and thoroughly discussed, which will undoubtedly result in advancing some proposition that will bring about the desired condition.

*Paper presented at December, 1908, meeting of the Western Railway Club.

ARTICULATED COMPOUND LOCOMOTIVES.*

BY C. J. MELLIN.

II.

The steam enters the high-pressure cylinders directly from the dome, where the throttle is located, as usual, and it exhausts into the high-pressure cylinder saddles on each side and meets at a point where the steam enters the intercepting valve. After passing through into the receiver pipe placed in the center of the front engine at a convenient height above the axles, it branches off through a "Y" pipe to each of the low-pressure cylinder saddles and through passages in these saddles to the steam chest. The exhaust from the low-pressure cylinders returns through the saddles and meets in a pipe delivering to the common exhaust pipe and the stack.

In order to obtain high efficiency and emergency power, various special details that may be of interest have been brought into use in these designs.

The throttle shown in Fig. 9 is provided with a steam separator at the extreme top, where the steam enters in an upward direction; and, after entering, meets a sharp turn downward whereby the entrained water is thrown against the curved walls of the crown, is entrapped at its base and forced down through a central passage back to the boiler by the inertia exerted in the trap. The continuous current of moisture that is abruptly arrested allows no chance for the water particles, once brought into contact with the curved wall of the crown, to escape the trap. The steam in relieving itself from the moisture makes the turn into the valve opening directly at the top and through the valve body to the lower opening as will be seen from the cut.

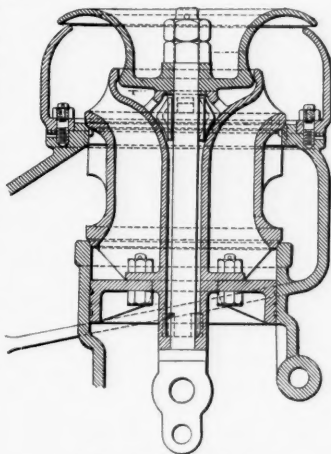


Fig. 9—Throttle.

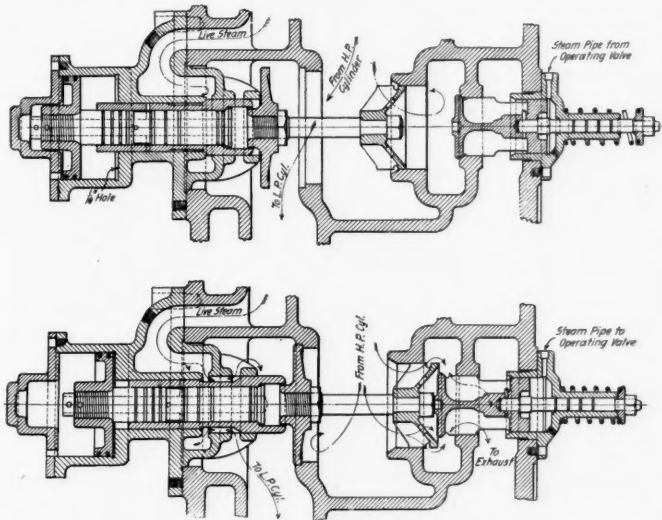


Fig. 10—Intercepting Valve.

Following the course of the steam, we do not meet any unusual construction of the passages until we reach the intercepting valve which, although not specially designed for this engine, should be considered in this connection as a most important factor; as it controls the pressure for the receiver and low-pressure cylinders, supplies steam direct from the boiler at a proportional pressure to the large cylinders in

*Presented at the New York meeting (December, 1908) of the American Society of Mechanical Engineers.

starting, prevents this pressure backing up against the high-pressure piston and makes it possible to increase the power of the engine about 20 per cent. at critical moments, by permitting the engine to be changed in such emergencies so as to work live steam in all cylinders with equivalent distribution of the work. With the exception of changing the engine into simple while under way, all its movements are automatic (Fig. 10).

The intercepting valve consists principally of two valves intimately combined; the one effecting the closing of the other; and a change valve by which the former is unbalanced in turning the engine into simple working when under way. The main valve closes the receiver and prevents the reduced live steam pressure from backing up against the high-pressure piston in starting and working simple, and by closing the exhaust valve the accumulation of exhaust from the high-pressure cylinders automatically opens the main valve to the low pressure side of the receivers and simultaneously closes the admission and reducing valve, whereby the engine is changed into compound.

The live steam admission and reducing valve has the form of a sleeve placed on the stem of the main valve; and, as seen in the cut, is allowed a limited longitudinal play to perform its double function.

The third, or change valve, has two functions to perform and is operated by the engineman in emergencies; and is, therefore, known as the emergency valve. Its use is resorted to only when the engine is about to stall on a heavy grade or at a difficult starting place. The first function of this valve is to unbalance the intercepting and reducing valves so that the former cuts off the low-pressure side of the receiver; and the second function is that of an outlet valve for high-pressure cylinder exhaust steam in working simple, which later is led in an independent pipe to the stack.

The next features of importance are the ball joints in the receiver and exhaust pipes which are peculiar to this type of engine. They consist (Fig. 11) of ball bearings, gland and packing. The latter is made of eight $\frac{1}{2}$ in. square rings of Vулcаbеstоn or fibrous packings laid, in pairs, in the middle of which a brass ring of an elongated diamond section is inserted. Being just the width of the packing space, this ring seals all joints in the packing rings proper and forces them, tightly against the inside of the box and against the ball. The receiver pipe, with the ball joint and its location, and the exhaust pipe are shown in Fig. 12.

The flexible exhaust pipe has two ball joints and one slip

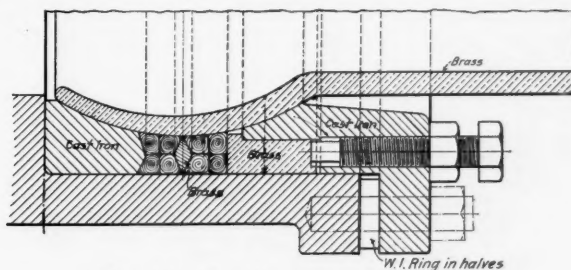


Fig. 11—Receiver Pipe Ball Joint.

joint; as it is subject to a greater angle of deflection and elongation than the receiver pipe, which has its ball joint in the vertical center line of the pivot pin between the two sets of engines.

The valve motion in each set of engines is of the Walschaerts type, driven by their respective main axles and crossheads and operated with a common reversing gear which simultaneously changes the motions of all the valves. Because of the lateral motion of the front engine in curving, means must be provided for flexibility in the operating gear so that this movement does not interfere with the motion of the valves. This is accomplished by using an exceptionally long lifting link, shown in Fig. 13, having a double jaw in its upper

end and a universal joint or ball bearing at the radius bar, which allows its lower end to follow the movement of the engine transversely relative to the rear engine, as well as the longitudinal movement of the valve in any angularity of the engine within the required limit of the swing.

The valve gear is operated by a hydro-pneumatic reversing

become a standard with these builders, but are of course subject to variations as may suit various service conditions.

The most striking variation in any of these details is probably the intermittent draft coupling of this type of locomotive turned out by the Baldwin Locomotive Works, shown in Fig. 16, where a lateral play is provided for, and the

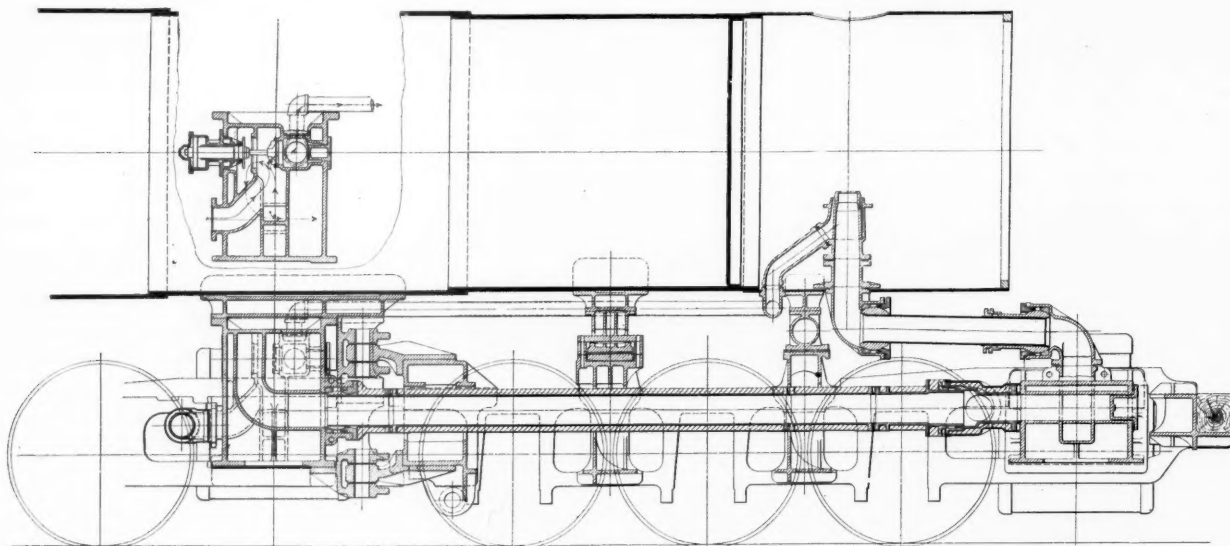


Fig. 12—Central Longitudinal Section from High Pressure to Low Pressure Cylinder Showing Steam Pipes.

mechanism, Figs. 14 and 15, consisting of one air and one oil cylinder, with the common piston rod connected to the main reversing lever. On a suitable location on the main lever is pivoted a second lever for operating the gear.

A forward movement of this lever throws its lower end backward, turning the valves of the air and oil cylinder (shown in Fig. 15), thus making communication with the rear end of the air cylinder for air pressure to force the piston forward and, with it, the entire gear. The oil cylinder serving as a lock and regulator has, by this movement, established communication between both sides of its piston, allowing the latter to follow the movement of the gear to which

It gives a moderate and uniform motion because of the contracted passage for the oil through the valve. By stopping the movement of the operating lever, the gear moves the main lever up to the given relation to the former; and then, automatically, shuts off the air supply and locks the oil cylinders.

In unlatching the operating lever, the same movement raises the main latch, which cannot drop until again in the given relation to the former, when the valves of both air and oil cylinders are closed and

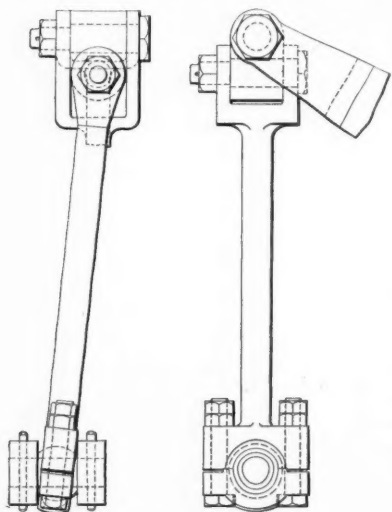


Fig. 13—Radius Bar Lifter.

a positive locking of the gear is secured in addition to that of the oil lock. The handle part of the main lever is made for the purpose of operating the engine by hand in the absence of air pressure or any disorder of the gear.

These illustrations show only a few parts peculiar to this special type of locomotive as ordinarily constructed by the American Locomotive Company. These locomotives have proved very satisfactory in every respect, and have practically

draft pin is held in a central position by a series of springs. With the exception of some articulated engines built by them for service in Porto Rico in 1904, the first of this type built by the Baldwin Locomotive Works were those constructed for the Great Northern Railway; the pivot connection of which is shown in the previous figure. Of this design 67 engines are now in service on the Great Northern, 3 on the Chicago, Burlington & Quincy and 16 on the Northern Pacific. The general design is shown in Fig. 17. These engines are giving universal satisfaction and the present number is the result of repeat orders without any change whatever in design.

The above mentioned builders have also excluded the use of by-pass valves, double ported slide valves, and the intercepting valve in their cylinder construction, the starting being

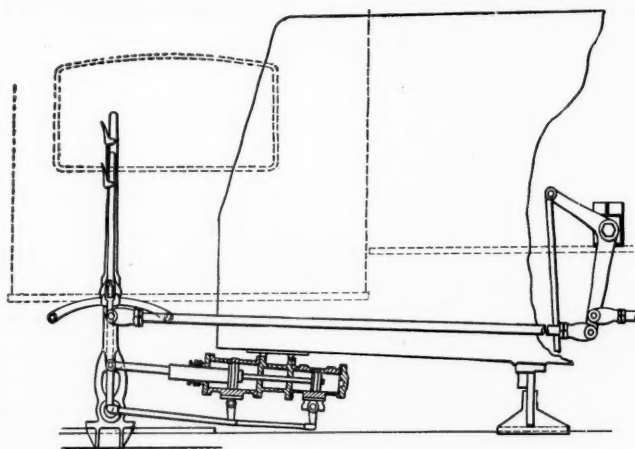


Fig. 14—Reverse Lever Arrangement.

effected by simply letting live steam into the receiver.

The question of superheating the steam in connection with this type of locomotive has been considered practically from the outset. Superheating would further increase the efficiency of the engine, but it has so far been deemed advisable to leave it off to avoid complications until this type becomes more generally known.

Fig. 18 illustrates a design of Mallet locomotive prepared

in accordance with instructions from Mr. Kendrick, Vice-President of the Atchison, Topeka & Santa Fe Railroad, now being built under his patents by the Baldwin Locomotive Works. In this design the combustion chamber which is also fitted with superheater device is used.

Among the various differences between this class of engines and that of the ordinary type, is the action of this engine when loaded to the slipping point. While the former is less liable to slip than the latter, due to a more uniform pressure on the pistons, they will not be considered loaded to anywhere near their capacity until slipping takes place,

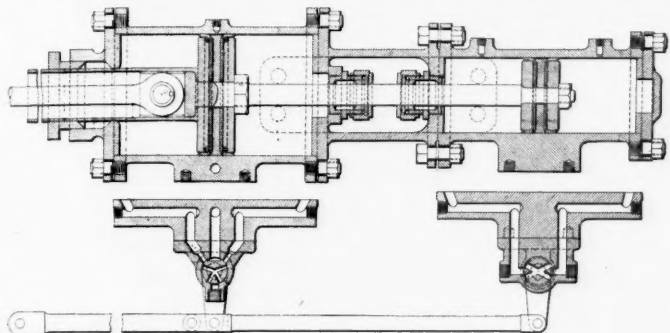


Fig. 15—Reversing Cylinders and Valves.

and consequently slipping does occur on heavy grades. With the ordinary engine, slipping at such times is a serious matter, as the train is losing speed and may stall on that account after a few repetitions. In the case of the articulated engines, the loss in power by the slipping of one engine is practically gained by the other, in the increase of unbalanced pressure that thereby results. This difference in the unbalanced pressure has the opposite effect on the slipping engine, usually causing it to stop slipping after a few revolutions, without the necessity of closing the throttle. This is explained by the fact that, when the low-pressure engine slips, the receiver pressure naturally falls and reduces the back pressure on the high-pressure piston, as well as the forward pressure on the low-pressure piston; causing the latter engine to stop slipping on account of the friction against the rail under the reduced receiver pressure, which reduction also increases the average unbalanced pressure on the high-pressure piston a corresponding amount.

When the high-pressure engine begins to slip, the receiver

slipping generally starts at irregular intervals of revolutions, depending on the condition of the engine as necessity for repairs. If the wheels are of a very close approximation to the same diameter and running on a straight track, these intervals are longer, because the opposition between the

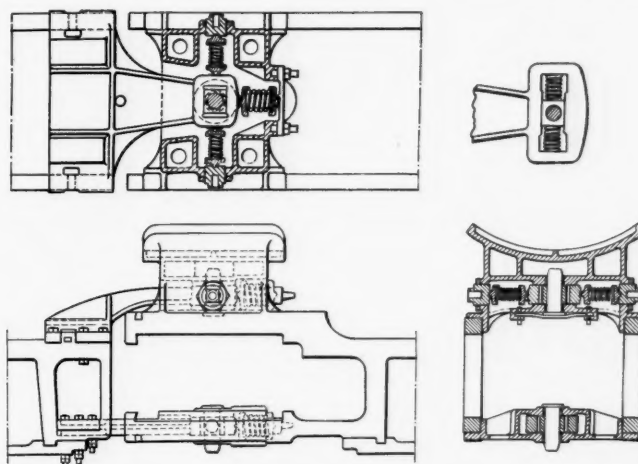


Fig. 16—Baldwin Frame Pivot Connection.

wheels requiring readjustment is less frequent than when the wheels are unevenly worn. In either case, there is the greatest liability for this adjustment in the neighborhood of the greatest turning movement; say every fourth or fifth revolution, on a normal rail condition. Being two independent engines, the coincidence of these conditions is very infrequent. The slipping of one engine may follow that of the other due to the temporary increase in power; but one is seldom found to start slipping, before the other has stopped slipping; and it can, therefore, be said without much exaggeration, that this type of engine is, in effect, a non-slipping engine.

When working live steam in all cylinders, generally known as working simple, the slipping is even less perceptible, although over 20 per cent. more power is developed; because the live steam supply to the low-pressure cylinders and the direct exhaust from the high-pressure cylinders are restricted to a very moderate piston speed. From the beginning of the slip, the low-pressure piston gets a rapid motion which

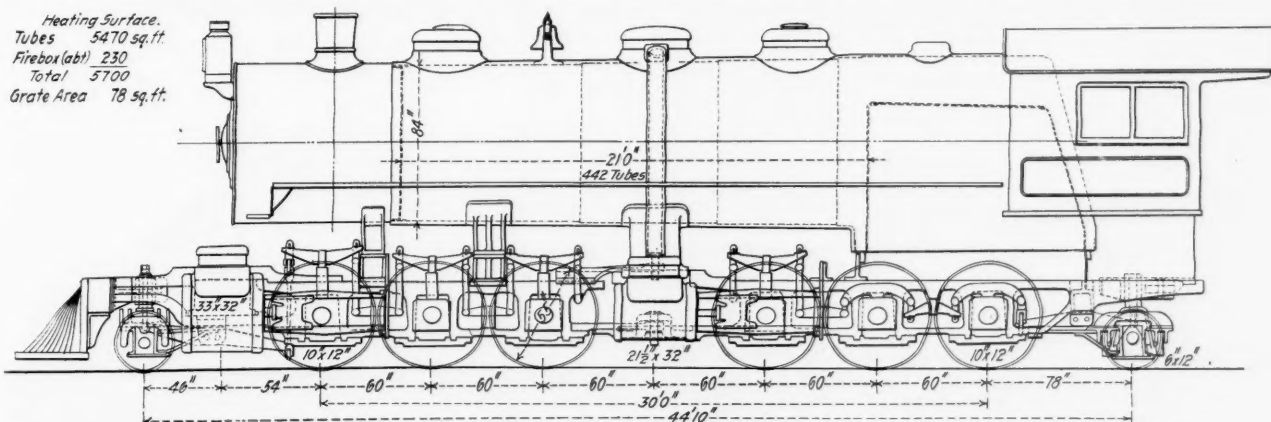


Fig. 17—Elevation of Articulated Locomotive for the Great Northern; Baldwin Locomotive Works.

pressure increases by the more rapid supply of steam, and with this the back pressure on the high-pressure piston is increased, causing this latter engine to resume its grip on the rail and increasing the power of the low-pressure engine until the normal power is restored in the high-pressure engine.

It is further to be noticed, that a simultaneous slipping of both engines is a very rare occurrence; due to the fact that there is one position of the crank where the turning effort is greater than in other positions, and this is where the

causes a sudden fall in the pressure and the slip generally stops after a few inches movement of the piston under normal weather and rail conditions. The restricted supply port being fully open, however, the pressure is restored practically simultaneously with the stopping of the slipping.

The high-pressure engines are not so sensitive; but after a couple of exhausts under slipping, the wheels regain their grip on the rail with comparatively small loss of power and in a period of short duration.

engine because it is difficult to give it any definite value; but is referred to as a reply to the often repeated supposition that these engines are hard to keep in repair. As a matter of fact the opposite is the case because on account of the sub-division of the work in two engines the parts are lighter and easier to handle in repairs and renewals.

One of the fundamental principles in locomotive engineering, as applied to conditions as they exist in the United States, is simplicity of construction. This has led to a general re-

luctance on the part of American railway officials to accept complications as long as they could avoid it. The tendency toward heavier trains has, however, made it necessary to supply units of larger hauling capacity than have heretofore been necessary anywhere in the world. For the most exacting freight service, locomotives are required which have entirely outgrown the possibilities of ordinary construction; in very much the same way as marine requirements have outgrown the types of propelling engines, which were entirely

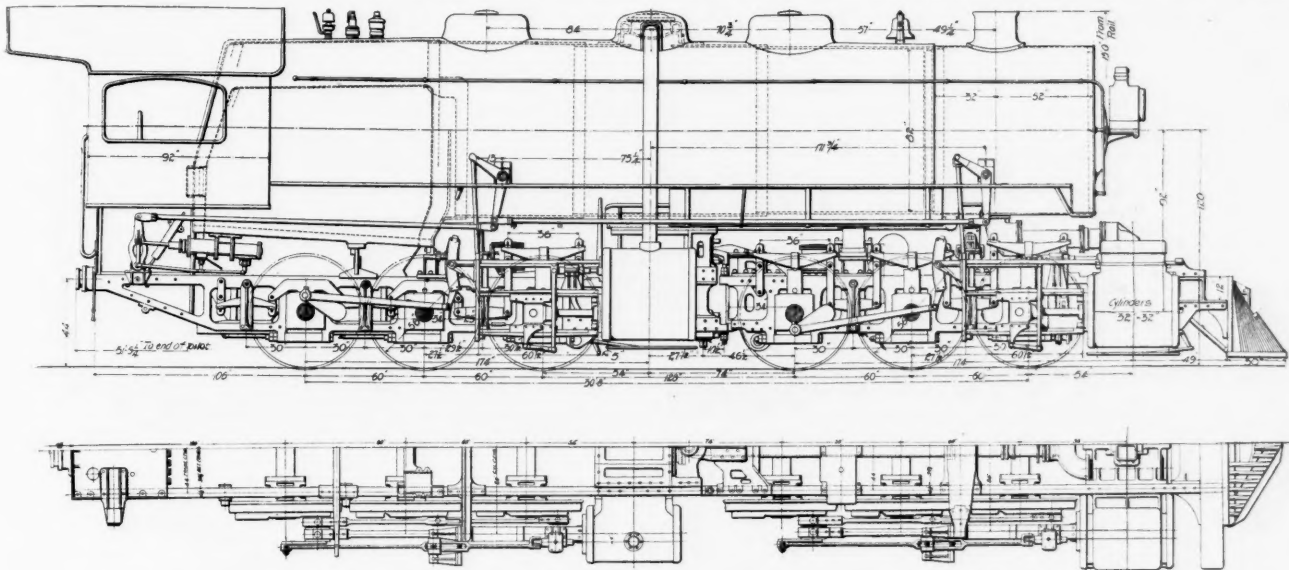


Fig. 21—Elevation and Half Plan of Articulated Locomotive for the Baltimore & Ohio. American Locomotive Company.

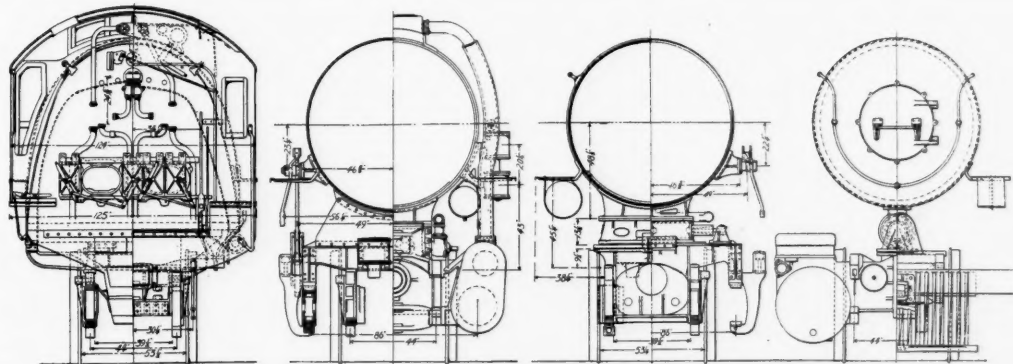


Fig. 22—Articulated Locomotive for the Baltimore & Ohio. American Locomotive Company.

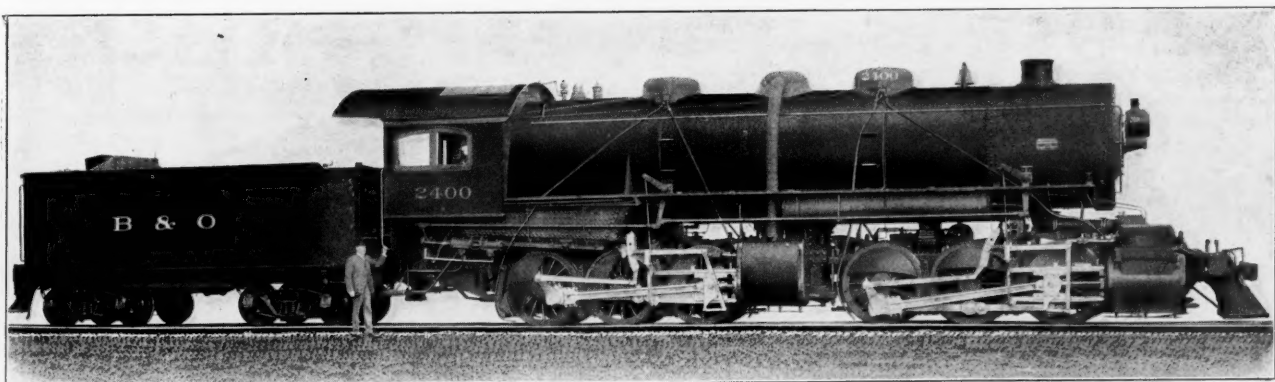


Fig. 23—The First Mallet Articulated Compound Locomotive Built in America. Built for the Baltimore & Ohio Railroad by the American Locomotive Company.

Gage of track	4 ft. 8½ in.	Outside diameter of tubes	2¼ in.
Diameter of cylinders	h. p., 20 in.; l. p., 32 in.	Length of tubes	21 ft.
Stroke of piston	32 "	Driving wheel base	30 ft. 8 in.
Diameter of driving wheels	56 "	Rigid wheel base	10 ft.
Outside diameter of boiler at front end	84 "	Total weight in working order	334,500 lbs.
Working pressure	235 lbs.	Weight on driving wheels	334,500 "
Length of firebox	108 in.	Tractive power	71,500 "
Width of firebox	96 "	Tractive power working simple	91,000 "
Number of tubes	436	Factor of adhesion	4.67

satisfactory a generation ago. In fact, the demand for units of large power compels special construction; in order that the large units may be operated without damage to the track and structures, and to avoid increasing the size of the moving parts of the locomotive to a prohibitive point.

The articulated locomotive represents the highest development in this branch of engineering; and the development is sufficiently important to justify the presentation of the subject in its present stage before a body of engineers who have

useful career. Mallet, like Walschaerts, is unable to realize the full benefit of his invention, owing to the time limit of patent law. The Baldwin Locomotive Works recognized the merit of his invention and in 1889 made a very careful investigation of the engine used by the Decauville Railway at the Paris Exposition, which I think was his first engine in public. Notwithstanding that Roentgen in 1834 took out patents for a compound locomotive, it was Mallet who in 1875 started the era of economics in locomotive building de-

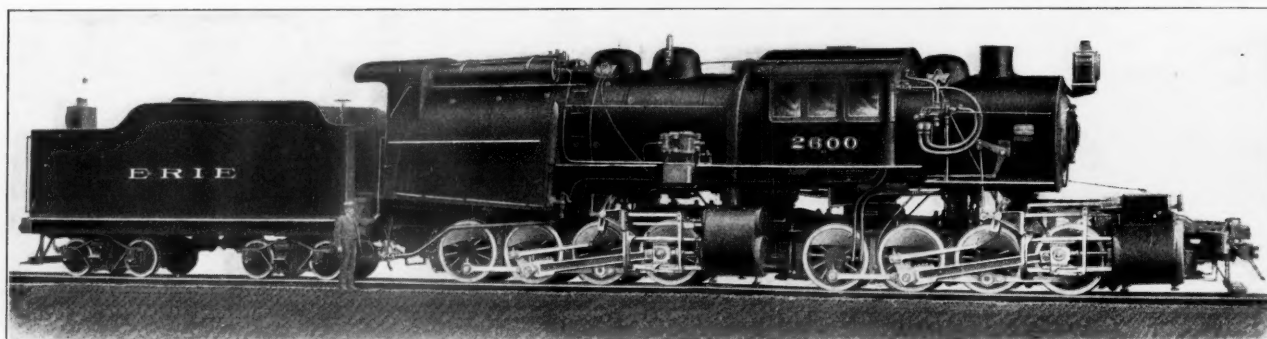


Fig. 24—Heaviest and Most Powerful Locomotive in the World. Mallet Articulated Compound Locomotive Built for the Erie Railroad by the American Locomotive Company.

Gage of track	4 ft. 3 1/2 in.
Diameter of cylinders	h. p., 25 in.; l. p. 39 "
Stroke of piston	28 "
Diameter of driving wheels	51 "
Outside diameter of boiler at front end	84 "
Working pressure	215 lbs.
Length of firebox	126 in.
Width of firebox	114 "
Number of tubes	404

This engine is equipped with boiler fitted with combustion chamber.

Outside diameter of tubes	2 1/4 in.
Length of tubes	21 ft.
Driving wheel base	39 ft. 2 "
Rigid wheel base	14 ft. 3 "
Total weight in working order	410,000 lbs.
Weight on driving wheels	410,000 "
Tractive power	34,800 "
Tractive power, working simple	120,000 "
Factor of adhesion	4.33

had much to do with corresponding developments in stationary or marine practice.

For the data and illustrations contained in this paper, the writer wishes to express his indebtedness to the American Locomotive Company and to Samuel Vaucrain, General Manager of the Baldwin Locomotive Works.

DISCUSSION BY SAMUEL M. VAUCLAIN.

It is not my purpose to criticize the admirable paper just read by Mr. Mellin, or to take exception in any way to statements made therein, nevertheless I do not coincide with him as to his conclusions, or in his treatment of the principle upon which Mr. Mallet has spent so many years of his most

stined to keep all minor lights such as Mr. Mellin and your humble servant fully occupied. I think it was a two-cylinder or cross compound locomotive built at Crusot for the Bayonne & Biarritz Railway—Roentgen's type. In 1877 he recognized, as has since been proven in America, the inefficiency of this type and went to the more sensible or four-cylinder, a tandem, I believe. But so rapidly did his mind work that during the same year he fled the tandem for a system in which the cylinders would couple to separate systems of wheels, and operate independently, but with one supply of steam. His idea was to use either a rigid framing or to articulate. The deGlehn engines, the first of which was built in 1885 for the *Chemin de fer du Nord* and later for the Paris, Lyons & Mediterranean, were of the former or solid frame pattern. He then successfully introduced that which we now accept as the

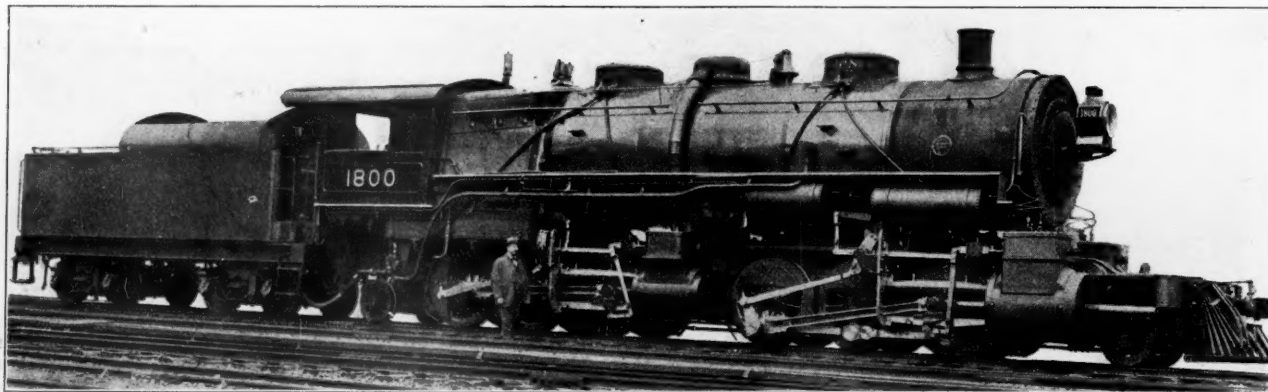


Fig. 25—Mallet Articulated Compound Locomotive Built for the Great Northern Railway, by the Baldwin Locomotive Works.

Gage of track	4 ft. 8 1/2 in.
Diameter of cylinders	h. p., 21 1/2 in.; l. p., 33 "
Stroke of piston	32 "
Diameter of driving wheels	55 "
Outside diameter of boiler at front end	84 "
Working pressure	200 lbs.
Length of firebox	117 in.
Width of firebox	96 "
Number of tubes	441

Outside diameter of tubes	2 1/4 in.
Length of tubes	21 ft.
Driving wheel base	30 ft.
Rigid wheel base	10 ft.
Total weight in working order	355,000 lbs.
Weight on driving wheels	316,000 "
Tractive power	71,600 "
Factor of adhesion	4.41

ideal, and we owe to Mr. Mallet all honor that may ensue from its introduction in this country. He will get nothing else, which must be greatly regretted.

I will not burden you with references to our efforts in his behalf—and our own as well—to establish a demand for this type of locomotive, until that of the year 1898. When our first proposition was made to the Erie Railroad Company, our ideas were quite large for that day, so much so that our customer was scared off. In this design we used an intermediate chamber to permit of shorter tubes, an old idea first used by Milholland.

Our next venture was to submit a design for a 12-wheel Mallet engine to Mr. Kendrick, of the Atchison, the most progressive and aggressive designer and user of locomotives I have ever had the pleasure of working with. But it was turned down, as was also one with a leading truck to its low-pressure engines and to which so great an exception has been taken by Mr. Mellin. (Mr. Vauclain showed a number of designs successively made in consultation with Mr. Kendrick, all having trucks.)

let's type of locomotive was none other than the empire builder of the northwest, Mr. Jas. J. Hill. His great power of penetrating to the depth of any new thing at once caused him to give us an order for five of these locomotives. We first submitted a truckless locomotive, but he declined, demanding a trailing as well as a leading truck. The complete satisfaction given by the arrangement of wheels has proven that his diversion from previous practice was justifiable, and also in accord with our own preference.

Mr. Hill was so well pleased that he asked for a lighter or smaller Mallet locomotive for road service and engines of this type were built, having only about 260,000 lbs. available for traction. The general excellence of these Mallet engines resulted in repeated orders until at present no less than 67 of both types are in daily service on the Great Northern Railway, working grades from six-tenths of 1 per cent. up to those of $2\frac{2}{10}$ per cent.

The most beautiful locomotive performance I have ever seen has been developed by the interest taken in these engines by the Great Northern officers, and especially their

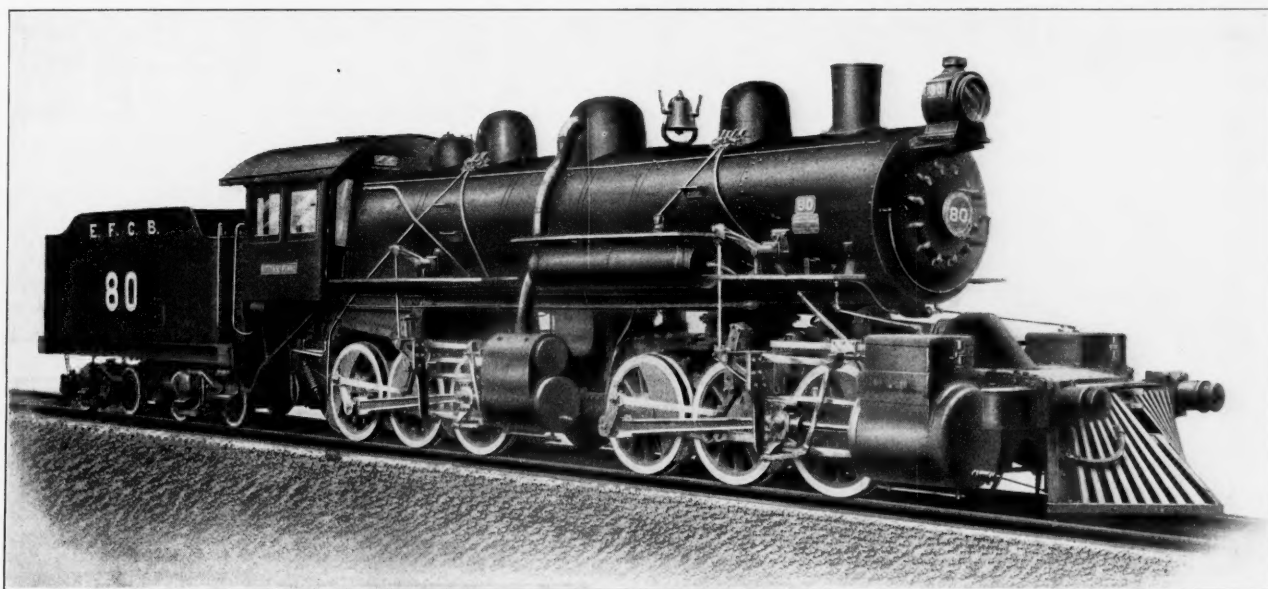


Fig. 26—*Mallet Articulated Compound Locomotive Built for the Central Railway of Brazil by the American Locomotive Company.

Gage of track	5 ft. 3 in.
Diameter of cylinders	h. p. 17½ in.; l. p. 28 "
Stroke of piston	26 "
Diameter of driving wheels	50 "
Outside diameter of boiler at front end	64 "
Working pressure	200 lbs.
Length of firebox	90 in.
Width of firebox	65 "
Number of tubes	234

Outside diameter of tubes	2 in.
Length of tubes	18 ft.
Driving wheel base	27 ft. 8 "
Rigid wheel base	9 ft.
Total weight in working order	206,000 lbs.
Weight on driving wheels	206,000 "
Tractive power	42,400 "
Tractive power, working simple	52,000 "
Factor of adhesion	4.86

The final outcome of all this work and mental anguish was sure to come and we now have under way for the Atchison, and in accordance with Mr. Kendrick's express views, large freight locomotives, showing the employment of a reheater, superheater and feedwater heater, a detachable front section, making all parts readily accessible and beyond doubt the most complete Mallet locomotive yet under construction, trucks and all included. The final passenger locomotives agreed upon, and now under construction have five pairs of driving wheels, a four-wheel truck to lead and a two-wheel truck to trail. How persistent some railway men seem to be, especially in the matter of trucks.

What may have been the first American Mallet locomotive built in America to go into regular service was that built for Porto Rico, an American dependency.

The next man to whom we applied for a trial of Mr. Mal-

superintendent of motive power, Geo. H. Emerson, whose mechanical judgment has contributed much to their design and ultimate success. Mr. Emerson fully indorses the use of trucks. No greater triumph could be had by Mr. Mallet than these locomotives. To him we give honor and reserve for ourselves the labor and resultant profit.

In Mexico all effort to introduce the Mallet type of locomotive proved unsuccessful until S. M. Felton assumed control of the Mexican Central. A man so strong and so progressive could not hesitate and at once ordered one Mallet similar to the Great Northern for trial, disregarding all objections. The engine has been built and is now near its destination.

It is necessary to give you a short resume of the struggle on the Southern Pacific. The outcome was a design in which the engineer was placed forward and the fireman in the rear in separate cabs, larger tanks and increased coal capacity, but the inevitable happened. Too many stops for drinks caused us to go to the regular American idea of a separate tender.

*See also *Railroad Age Gazette* of November 27, p. 1444, for full illustrated description of Mallet articulated compound for Santo Domingo.

Therefore, a further study was made and design submitted using throughout as many of the Harriman standards as possible. This design shows the logical outcome, and we are now building for the Southern Pacific two large Mallet locomotives for use on their Sierra mountain. The low-pressure cylinders are detachable, the boiler is separable, and the steam en route from the high-pressure cylinders to the low-pressure cylinders passes through a Vaucrain re-heater. It would be impossible for me to, at this time, give you a synopsis of all that has been done for other roads or of the orders pending or even the numerous orders we now enjoy for engines of this type. Our knowledge of the subject has been gained by a very careful study of foreign practice.

I beg your indulgence, one moment longer, to show you a design of articulated locomotive, of my own, and so far as the patent office is concerned, entirely original. You will

SOUTHERN PACIFIC AIR BRAKE TESTS.

III.

QUICK RECHARGE AND PRESSURE MAINTENANCE FEATURES.
SERVICE APPLICATIONS.

To further illustrate the maintenance of satisfactory safety reserve stored volume in the brake system at all times, additional demonstrations were made similar to those mentioned, (Fig. 22—see Dec. 11, p. 1541) except that repeated heavy service applications were made at short intervals and then an emergency application following.

On Table 3 are given the official data taken showing pressures used, time intervals between applications and brake cylinder pressures resulting.

It will be noted that from 110 lbs. brake-pipe pressure $52\frac{1}{4}$ lbs. was secured in brake cylinder on first car from first ap-

Demonstration Number	Equipment Used	Application Number	Application Cycles				Brake Pipe Press. Pounds		Brake Cylinder Pressure Pounds							Auxiliary Reservoir Press. Pounds			Sup. Res. Pressure Pounds			
			Seconds in Full Release Position	Seconds in Running Position	Seconds in Application & Lap Positions	Time of Gauge Reading	Main Reservoir Pressure Pounds	Time of Gauge Reading	Engine	1st. Car	Time of Gauge Reading	Engine	Tender	1st. Car Gauge	1st. Car Indicator	7th. Car Gauge	7th. Car Indicator	Time of Gauge Reading	1st. Car	7th. Car	1st. Car	7th. Car
514 P	P	1			15	A	130 $\frac{1}{2}$	H			I	22	48	52 $\frac{1}{4}$	51	45	43	H	110	110 $\frac{1}{2}$		
						BR	137 $\frac{1}{2}$	E	96	96 $\frac{1}{2}$	AR			49 $\frac{1}{4}$	49	42	41	L	97	95 $\frac{1}{2}$		
		2	5	5	15	A	129 $\frac{1}{2}$	H		120	I	22	50	48 $\frac{1}{4}$	45	38	35 $\frac{1}{2}$	H	103 $\frac{1}{2}$	102 $\frac{1}{2}$		
						BR	139 $\frac{1}{2}$	E	91 $\frac{1}{2}$	90 $\frac{1}{2}$	AR			45 $\frac{1}{2}$	44 $\frac{1}{2}$	36	35	L	91	90 $\frac{1}{2}$		
		3	5	5	15	A	132	H		120	I	22	54	48 $\frac{1}{2}$	47 $\frac{1}{2}$	36	33	H	101	99 $\frac{1}{2}$		
						BR	140	E	89	88 $\frac{1}{2}$	AR			45 $\frac{1}{2}$	46	33	32 $\frac{1}{2}$	L	89	87 $\frac{1}{2}$		
		4	5	5	15	A	133	H			I	20	50	44 $\frac{1}{2}$	43	32	29	H	99	96 $\frac{1}{2}$		
						BR	140	E	86 $\frac{1}{2}$	85 $\frac{1}{2}$	AR			43 $\frac{1}{2}$	43	29	28 $\frac{1}{2}$	L	87	86		
		5	5	5	15	A	133 $\frac{1}{2}$	H		117	I	52	80	74	72	72	67 $\frac{1}{2}$	H	96	93 $\frac{1}{2}$		
						BR	140	E	0	0	AR			59 $\frac{1}{2}$	61	57 $\frac{1}{2}$	56 $\frac{1}{2}$	L	60	58 $\frac{1}{2}$		
414 L	L	1			15	A	111 $\frac{1}{2}$	H			I	43	45	64 $\frac{1}{2}$	65	55	53	H	90	90 $\frac{1}{2}$		89 $\frac{1}{2}$
						BR	118	E	90	90 $\frac{1}{2}$	AR				61 $\frac{1}{2}$	53	51	L	73	74 $\frac{1}{2}$		85
		2	5	5	15	A	115	H		101	I	35	37	65	64	60	55 $\frac{1}{2}$	H	88	87		85
						BR	123	E	89	88 $\frac{1}{2}$	BR			59 $\frac{1}{2}$	62	55	56	I	70	72 $\frac{1}{2}$		82
		3	5	5	15	A	117 $\frac{1}{2}$	H		102	I	34	36	63	62	50	45 $\frac{1}{2}$	H	86	84		82
						BR	125	E	88		BR			60 $\frac{1}{2}$	62	45	44	I	71	73		80
		4	5	5	15	A	118 $\frac{1}{2}$	H		102	I	35	37	62	62	44	40 $\frac{1}{2}$	H	86	83		80
						BR	127	E	87	85 $\frac{1}{2}$	BR			58 $\frac{1}{2}$	60 $\frac{1}{2}$	40	39 $\frac{1}{2}$	I	70	72 $\frac{1}{2}$		79 $\frac{1}{2}$
		5	5	5	15	A	118 $\frac{1}{2}$	H		103	I	75	78	80 $\frac{1}{2}$	80	79	74	H	85	82		
						BR	124	E	86	82 $\frac{1}{2}$	BR				80		74 $\frac{1}{2}$	L	74	69 $\frac{1}{4}$		

Table 3—Passenger Standing Demonstrations.

Pressure maintenance with schedules L and P equipments. Repeated heavy service applications at short intervals, followed by emergency.

notice that the design differs from that of Mallet, in making a flexible boiler in place of allowing it to move laterally on the low-pressure engine. The boiler is in two sections, each firmly secured to its own cylinders, and framing which are hinged a la Mallet, but the boiler is joined by a flexible connection between the two smoke chambers containing the superheater and reheater. The excellence of this design has yet to be appreciated, but what little mechanical or engineering reputation I may enjoy is cheerfully placed in jeopardy by its recommendation. No fear need be had as to the life of the flexible connection. There is no more opportunity for cinders to invade its minor recesses than has water to get under the scales of a fish.

plication with P triples, and 44 $\frac{1}{2}$ lbs. from 4th application. This followed by 74 lbs. from the 5th, an emergency application as against 64 $\frac{1}{2}$ lbs. in the first car brake cylinder from first application with L triple valve from 90 lbs. brake-pipe pressure, and 62 lbs. from 4th application, followed by 80 $\frac{1}{4}$ lbs. from the 5th, an emergency application.

These comparisons are particularly valuable when considering the effective results desired from the use of brake equipment on heavy grades and on divisions where congested traffic makes it necessary to use heavy brake applications repeatedly in quick succession, with the possibility of it being necessary at any instant to use an emergency application to save life or property.

On Fig. 23 are shown the tracings from the brake cylinder indicator diagrams taken during the demonstrations.

These diagrams graphically represent the results of this important demonstration and, when considered in connection with the figures given in the preceding table, make it possible to readily appreciate the comparisons shown.

The important point demonstrated is the maintenance of pressure throughout repeated severe demands upon the stored volume, the final satisfactory pressure secured in emergency with the L equipment and the maintenance of this high pressure throughout the application.

The 80 lbs. final pressure secured by the emergency application with the L triple valve being from 90 lbs. original brake-pipe pressure, as against the 72 lbs. with the P triple from 110 lbs. original brake-pipe pressure.

QUICK RECHARGE AND PRESSURE MAINTENANCE FEATURES, WITH PUMP STOPPED.

To further illustrate the comparative advantages of the quick recharge and additional stored volume with Schedule

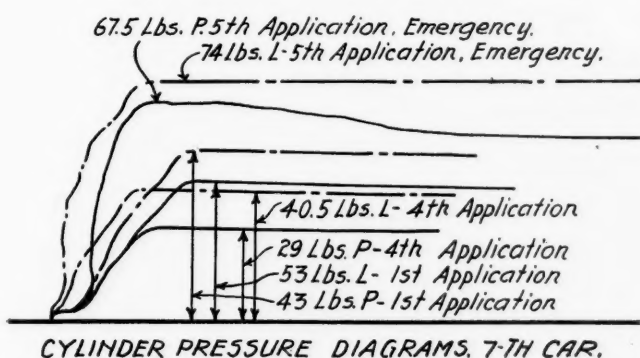
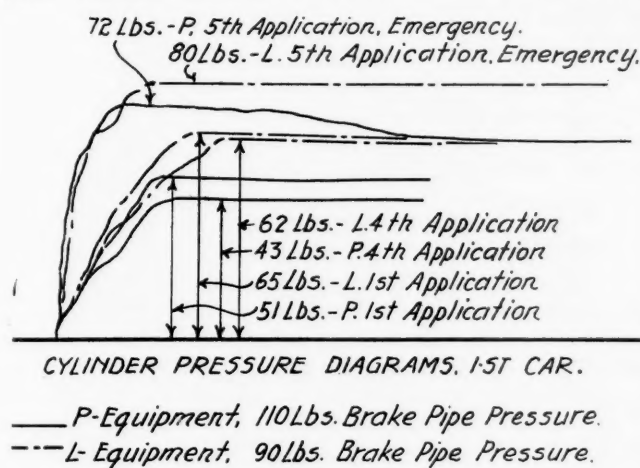


Fig. 23—Passenger Standing Demonstrations.

Pressure maintenance with schedules L and P equipments. Repeated heavy service applications at short intervals, followed by emergency.

LN improved equipment, demonstrations were made similar to those described on Table 3 and Fig. 23, except that the pump was stopped to show the available reserve in the event of disabled air supply.

From 130 lbs. initial main reservoir pressure and 110 lbs. initial brake-pipe pressure but 22 lbs. was secured in brake cylinder on first car from the 7th application with P equipment, whereas from 110½ lbs. initial main reservoir pressure and 90 lbs. initial brake-pipe pressure 38 lbs. pressure was secured in brake cylinder on first car from 7th application with L equipment.

The higher average brake cylinder pressure secured from all of the applications with L equipment illustrates the effective use of the additional stored reserve carried in the supplementary reservoirs in an emergency of this kind.

It is impossible to release the brakes with L triple valves when main reservoir pressure is depleted to a point below

supplementary reservoir pressure, in which event the triple valves would be lapped in release, producing an automatic safety feature by stalling the train.

GRADUATED RELEASE FEATURE.—NEW AND OLD METHOD OF MAKING SERVICE APPLICATIONS.

On Fig. 24 is shown an interesting comparison of the new and old methods of controlling the pressure into and out of the brake cylinders. It has been the custom with standard equipment to graduate the pressure into the brake cylinders during the applications, and, as no graduation of release could be made, this pressure was completely released during the stop with the probable necessity of making an additional application to hold the train at rest.

It will be of interest to note on Fig. 24 the shape of the diagram made by the brake cylinder pressure indicator during this demonstration with P equipment, showing the graduations of pressure into the brake cylinder, the unequal maximum pressure maintained by the high-speed reducing valve, and the final complete release, illustrating the necessity for a second application.

This is in marked contrast to the diagram of similar demonstration with the L triple, from which it will be noted that the pressure was placed into the brake cylinder in one graduation and advantage taken of the facility for graduating the pressure out of the brake cylinder during release, making it possible to secure a smooth stop, and at the same time retain the pressure in the brake cylinder as indicated by the last graduation.

This last pressure of 19½ lbs., as shown, would be sufficient to hold the train at rest, and at the same time permit a prompt start, as but short time would be required to secure a final release as against the longer time which would be required to

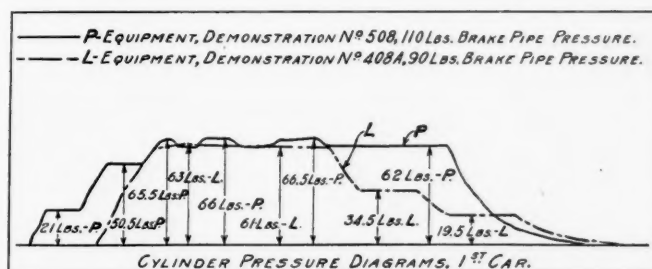


Fig. 24—Passenger Standing Demonstrations.

Cylinder pressure diagrams, showing methods of making service applications and releasing brakes with L and P equipments.

secure release of maximum pressure if a one application stop had been made with P equipment.

PASSENGER RUNNING TESTS—HIGH EMERGENCY PRESSURE FEATURE.

To secure comparative data regarding the operation of the standard and improved air brake equipment for passenger cars under actual operating conditions, runs were made on the practically level track of the Hayward division between Hayward and Niles, Cal., using trip emergency applications for stopping with both types of equipment, the chronograph station with trip and track contacts being near Halvern Siding. Most of the runs were with engine No. 3026 and 8 passenger cars, 5 of them being standard 60 ft. coaches, and 3 of them standard buffet cars. Some of the higher speed runs were with same locomotive and but 5 of the cars. In Table 4 is shown the general data collected during the series of demonstrations, and, for better appreciation of the comparative results secured, graphical diagrams have been drawn from the data shown in Table 4, and the curves are shown on Figs. 25, 26, 27 and 28. The important point demonstrated in this particular series is the securing of higher brake cylinder pressures with the improved equipment from the same initial pressures and similar brake cylinder pressures from 20 lbs. less initial brake-pipe pressure than with standard equipment and the maintenance of the brake cylinder pressures throughout the stops, securing shorter stops with the improved equipment. The results secured indicate definitely

TABLE 4.—PASSENGER RUNNING DEMONSTRATIONS.

Emergency Applications of Westinghouse Improved and Standard-Air Brake Equipment with 5- and 8-Car Trains of Passenger Equipment Cars at Hayward, Cal. Western Division, Southern Pacific Co. July, 1908.

Line No.	Demonstration No.	No. cars in train.	Date—1908.	Time of day.	Equipment used.	Indicated speed.	Chronograph speed.	Length of stop, ft.	Time of stop, secs.	Depth water in tender, in.	W't water in tender, lbs.	Depth oil in tender, in.	W't oil in tender, lbs.	Condition of rail.	Relative humidity, p.ct.	Atmosphere, deg. F.	Kind of weather.	Direction of wind.	Brake-pipe pressure, lbs.	Engine.	1st car.	5th car.
1.	1	3	July 23	10.42 a.m.	P	65 3/4	53.98	1,082.2	22.6	30	18,824	60 1/2	19,080	Good.	67	70	Fair.	Still.	80	79 1/4	79	
2.	101	3	" 23	11.07 "	P	65 3/4	54.20	1,232.6	26.8	22	11,872	59	18,432	"	65	71	Clear.	"	80	79 3/4	79	
3.	102	3	" 23	9.03 "	P	75	57.18	1,206.8	24.4	58	41,750	65	20,992	"	79	65	Cloudy.	"	81	80 1/4	80	
4.	103	3A	" 23	10.03 "	P	76	60.53	1,622.0	31.4	40 1/2	28,307	62 1/2	19,936	"	75	68	Fair.	"	80 1/2	80 1/4	79	
5.	103A	3A	" 23	2.50 1/2 p.m.	P	85	71.88	2,252.3	36.4	37	25,282	54	16,296	"	64	70	"	Sl. Nor.	80 3/4	80 1/4	79 +	
6.	103	3A	" 23	11.11 1/4 a.m.	P	81	66.68	2,079.8	37.4	41	28,725	63	20,144	"	70	69	"	"	80 3/4	80 1/4	80	
7.	103A	3A	" 23	3.49 1/2 p.m.	P	85	71.06	2,482.4	41.4	48	34,406	49 1/2	14,360	"	65	70	"	"	80 3/4	80 1/4	80	
8.	104	4	" 23	2.40 3/4 "	P	85	74.41	2,357.4	37.4	50	35,910	55 1/2	16,936	"	52	77	Clear.	"	81	80 1/4	80	
9.	104	4	" 23	1.58 "	P	85	73.66	2,598.3	42.8	63	44,950	58	18,008	"	56	77	"	"	80 3/4	80 1/4	80	
10.	105	5	" 23	2.31 "	P	64	54.01	979.0	21	49	35,158	54	16,296	"	59	73	"	Still.	90	90 1/2	90 1/4	
11.	105	5	" 23	1.56 "	P	63	53.30	1,124.1	24.6	60	43,028	55 1/2	16,936	"	60	72	"	"	90	90 1/2	90 1/4	
12.	113	6	" 24	12.05 1/4 "	P	61 1/2	51.58	961.9	21.6	46	32,818	58	18,008	"	59	74	"	"	109 1/2	110	109 1/4	
13.	113	6	" 23	5.51 "	P	77 1/4	62.82	1,422.0	26	51	36,612	44 1/2	12,200	"	61	71	"	"	90 1/2	90 1/2	89 3/4	
14.	106	6	" 23	4.57 1/2 "	P	77 1/4	63.13	1,722.7	32.4	66	46,947	46 1/2	13,064	"	57	74	"	"	90	90 1/2	89 3/4	
15.	114	8	" 24	2.39 1/2 "	P	76	62.04	1,364.6	26.2	33 1/2	22,132	56	17,152	"	59	74	"	"	110 1/2	110	110	
16.	201	7	" 25	11.12 1/2 a.m.	L & P	76	61.5	1,288.6	24.4	32	20,687	62	19,720	"	59	76	"	"	111	110	110	
17.	7	7	" 23	3.02 p.m.	P	84 +	67.54	1,673.3	29	38	26,134	51 3/4	15,328	"	60	72	"	"	90	90 1/2	89 3/4	
18.	107	8	" 23	3.43 "	P	85 +	68.22	2,037.6	35.8	26	15,331	49 1/2	14,360	"	59	73	"	"	90	90 1/2	89 3/4	
19.	15	8	" 24	6.07 1/4 "	P	85 +	68.89	1,734.0	29.4	40 1/2	28,307	49	14,144	"	66	69	"	"	90	90 1/2	89 3/4	
20.	115	8	" 24	4.38 3/4 "	P	85 +	69.97	1,890.9	33	60	43,028	52	15,440	"	66	69	"	"	110	110	110	
21.	8	8	" 25	3.52 1/4 "	P	85	76.48	2,403.0	37.4	78	53,055	53	15,872	"	53	77	"	Sl. Nor.	91	91 1/2	90 1/4	
22.	108	8	" 27	9.08 3/4 a.m.	P	85	72.82	2,435.5	41.2	59	42,385	62	19,720	"	68	72	Cloudy.	"	91	90 1/4	90 1/4	
23.	116	8	" 25	4.49 1/4 p.m.	P	85	77.21	2,561.3	40.8	57	41,015	50	14,576	"	53	77	Clear.	"	110 1/2	111	111	
24.	202	8	" 27	9.45 1/2 a.m.	P	85	73.97	2,314.5	38	44	31,122	59 1/2	18,648	"	66	75	"	"	110	110	110	
25.	203	8	" 27	10.26 "	P	85	73.03	2,298.0	38.8	32	20,687	57	17,584	"	63	76	"	"	110	110	110	
26.	12	8	" 24	9.42 "	P	61 1/4	49.98	783.5	18	59 1/2	42,870	67	21,840	"	67	70	"	Still.	100 3/4	101	100	
27.	109	8	" 24	9.04 "	P	60 1/2	49.10	852.8	20.4	72	50,197	68	22,264	"	67	70	"	"	100	100	100	
28.	110	8	" 24	10.08 3/4 "	P	76	60.83	1,427.8	28	50	35,910	65 1/2	21,208	"	64	71	"	"	100 3/4	101	100	
29.	12A	8	" 24	11.39 3/4 "	P	85	68.99	1,679.5	28.4	56	40,288	59 1/2	18,648	"	58	74	"	"	100 1/2	100	100	
30.	111	8	" 24	11.04 "	P	85	67.92	1,902.9	34.2	75	51,676	62	19,720	"	60	73	"	"	100 1/2	100	99 1/2	
31.	6A	8	" 25	9.38 1/2 "	P	76	59.96	1,126.6*	21.4*	55	39,519	66	21,416	"	61	76	Cloudy.	"	90 +	90 1/2	89 1/4	
32.	114A	8	" 25	10.06 "	P	76 1/2	60.74	1,235.3†	23.6†	44	31,122	64	20,568	"	61	75	Clear.	"	110	110	109 1/2	

TABLE 4.—PASSENGER RUNNING DEMONSTRATIONS.—(Continued.)

Line No.	En- gine.	Ten- der.	Brake cylinder pressure, lbs.										Av'ge cylinder press.	Auxiliary reservoir pressure, lbs.								Time gage read- ing.
			1st car in- dicator.	2d car.	3d car.	4th car.	5th car.	5th car in- dicator.	6th car.	7th car.	8th car.	1st car.		2d car.	3d car.	4th car.	5th car.	6th car.	7th car.	8th car.		
1.	65	68	72	70 3/4	73	74	75	74 1/2	70 1/2	74	75	75	74.0	79	80 3/4	79 1/2	79 1/2	80	79 1/2	79 1/2	H	
2.	63	66	70 1/2	70 3/4	73	73	74	72 1/2	72	73	74	72.8	79 1/2	80 3/4	78 1/2	79 1/2	80	80	79 1/2	79 1/2	H	
	50	62	58 1/2	58	60	60	59 1/2	61 1/2	59	59	59 1/2	60.1	79 1/2	80 3/4	78 1/2	79 1/2	80	80	79 1/2	79 1/2	H	
3.	43	59	57 1/2	57 1/2	58	60	58 1/2	60	59	58	57 1/2	58.8	80	81 3/4	80 1/2	80	81	80	80	80	H	
	68	68	73	72	74	75	76	75 1/2	70	75	76	75	74.9	80	81 3/4	80 1/2	80	81	80	80	H	
4.	66	64	71	71 1/2	73 1/2	74	75	73 1/2	70	72	74	74	73.4	80	80 3/4	79 1/2	79 1/2	80 1/2	79 1/2	79 1/2	H	
	50	62	58 1/2	57 1/2	61	66	59	61 1/2	59	58	59	60.1	80	80 3/4	79 1/2	79 1/2	80 1/2	79 1/2	79 1/2	79 1/2	H	
5.	42	58	57 1/2	57 1/2	58	66	68	59 1/2	59	57	57	61	58.5	80	79 3/4	79 1/2	80	81	79 3/4	79 1/2	H	
	70	70	72	70 1/2	73	72	75	74 1/2	70 1/4	75	75	74	73.8	80	79 3/4	79 1/2	80	81	79 3/4	79 1/2	H	
6.	68	66	69 1/2	69 1/2	72	71 1/2	74 1/2	72	70 3/4	71	72	72 1/2	71.9	80	80 3/4	79 1/2	80	80	80	80	H	
	50	65	55 1/2	56	59	60	59	63	58 1/2	59	60 1/2	62	59.8	80	80 3/4	79 1/2	80	80	80	80	H	
7.	41	66	55 1/2	56	55	60	58 1/2	59	58 1/2	57	58	60 1/2	57.9	80	79 3/4	79 1/2	79	80 1/2	79 3/4	79	H	
	52	60	54 1/2	55 1/2	57	60	59 1/2	62	58	58 1/2	59	63	59.2	80	79 3/4	79 1/2	79	80 1/2	79 3/4	79	H	
8.	40	60	54	54 1/2	57	59	59	58 1/2	58	57 1/2	57	61	57.9	80	81 1/4	79 1/2	81	81 1/2	80	80	H	
	62	65	75	72 1/2	74	74 1/2	76	75 1/2	71 1/2	75	75	72 1/2	73.1	80	81 1/4	79 1/2	81	81 1/2	80	80	H	
9.	58	62	72	72 1/2	73	73	75	72 1/2	71 1/2	75	75	72 1/2	73.1	80	81 1/4	79 1/2	81	81 1/2	80	80	H	
	52	60	58 1/2	58	60	60	59	63	59	59	59	63	60.1	80	81 1/4	79 1/2	81	81 1/2	80	80	H	
10.	40	57	56 1/2	57	56 1/2	59	57	58	58	58	58	61	57.4	80	81 1/4	79 1/2	81	81 1/2	80	80	H	
	65	70	80 1/4	80 1/4	82	73	85	84 1/4	80	84 1/4	85 1/2	85	82.4	90	91	90	90	91	90	90	H	
11.	63	65	79 1/4	80	82	73	84 1/2	83 3/4	80	82 1/4	83 3/4	83	81.4	90	91	90 1/2	89	91	90	90	H	
	55	70	80 1/4	80 1/4	82	73	85	84 1/4	80	84 1/4	85 1/2	85	82.4	90	91	90 1/2	89	91	90	90	H	
12.	45	60	59	60 1/2	56 1/2	56	57	60	59 1/2	58	58 1/2	60	58.1	110	110 1/2	109 1/2	110	110	110	110 1/2	H	
	70	85	74	73	72	76	76	75 1/2	71	78 1/2	80	81	76.5	110	110 1/2	109 1/2	110	110	110	110 1/2	H	
13.	59	62	59 1/2	60 1/2	57	57	56	61	61	57 1/2	60	72	60.0	90	91	90 1/2	90	91	90	90	H	
	68	70	81 1/4	80 3/4	82	83	84 1/2	84 3/4	80	83 1/4	85 1/2	85	83.7	90	91	90 1/2	90	91	90	90	H	
14.	64	66	80 1/4	80 3/4	81 1/2	82	84	82 3/4	80	81 1/2	83 1/2	84	82.4	90	91	90	90	90 1/2	90	90	H	
	60	70	80 1/4	80 3/4	81 1/2	82	84	82 3/4	80	81 1/2	83 1/2	84	82.4	90	91	90	90	90 1/2	90	90	H	
15.	43	60	59	60	56 1/2	56	56 1/2	56 1/2	56	59	58 1/2	60	58.0	90	91	90	90	90 1/2	90	90	H	
	70	85	76	75 1/2	77	78	80	75 1/2	72	78 1/2	80	83	78.8	110	111 1/2	110	111	110 1/2	110	110 1/2	H	
16.	57	62	59	60 1/2	57	57	57	57	59 1/2	58	58 1/2	70	59.7	110	111 1/2	109 1/2	111	111	110	110 1/2	H	
	70	86	76	74 1/2	81	81	81	80	74 1/2	71	79 1/2	80	78.6	110	111 1/2	109 1/2	111	111	110	110 1/2	H	
17.	58	61	59	60 1/2	81	81	81	80	59 1/2	71	79 1/2	80	78.6	110	111 1/2	109 1/2	111	111	110	110 1/2	H	
	65	70	80 1/4	80 1/2	82	83	84 1/2	83 3/4	79	84 1/4	85 1/2	86	83.7	90	91	90	90 1/2	90	90	90	H	
18.	64	66	78 3/4	80	81 1/2	82	84	82 3/4	79	81 1/2	82 1/2	84	82.1	90	91	90	89 1/2	90 1/2	90	90	H	
	60	70	80 1/4	80 1/2	82	83	84 1/2	83 3/4	79	81 1/2	82 1/2	84	82.1	90	91	90	89 1/2	90 1/2	90	90	H	
19.	43	58	58 1/2	60 3/4	56 1/2	56	56 1/2	57	59	59	59	58 1/2	58.1	90	91	90	89 1/2	90	90	90	H	
	70	88	76	76	78	77	80	75 1/2	71	78 1/2	80	82	78.6	100	111 1/2	110	110 1/2	111	110	110 1/2	H	
20.	62	66	79 3/4	80 1/4	81 1/2	82	84	82 1/4	80 1/4	83 1/4	85 1/2	85	83.7	90	91	90	90	90 1/2	90	90 1/2	H	
	66	70	80 1/4	80 1/2	82	83	84 1/2	83 3/4	80 1/4	83 1/4	85 1/2	85	83.7	90	91	90	90	90 1/2	90	90 1/2	H	
21.	54	61	59 1/2	61	56	57	57	60	59	59	58 1/2	60	58.1	100	111 1/2	110	110 1/2	111	110	110 1/2	H	
	72	70	83 1/4	81	83	84	85	84 3/4	80 1/2	83 1/4	85 1/2	85	83.7	90	91	90	90	90 1/2	90	90 1/2	H	
22.	65	68	80 3/4	81 1/2	82 1/2	82 1/2	84 1/2	82 3/4	80 1/2	83 1/4	85 1/2	85	83.7	90	91	90	90	90 1/2	90	90 1/2	H	
	60	70	80 1/4	80 1/2	82	83	84 1/2	83 3/4	80 1/4	83 1/4	85 1/2	85	83.7	90	91	90	90	90 1/2	90	90 1/2	H	
23.	42	56	59	60 1/2	56 1/2	57	57 1/2	60	58 1/4	59	58 1/2	60	58.1	90	91 1/2	90 1/2	90	91	90	90	H	
	70	86	74	74	77	76	79	74 1/2	71	78 1/2	80	82	78.6	111	112	111	111	111 1/2	111	110 1/2	H	
24.	48	60	59	60	56 1/2	57	57	60	59	59	58 1/2	60	58.1	90	91 1/2	90 1/2	90	91	90	90	H	
	70	80	76	74 1/4	77	76	79	74 1/2	71	78 1/2	80	82	78.6	110	111 1/2	110 1/2	110 1/2	111 1/2	111	110 1/2	H	
25.	50	60	59 1/2	60 1/2	57	57	58	60	58 1/2	59	58 1/2	60	58.1	90	91 1/2	90 1/2	90	91	90	90	H	
	70	80	76	74	77	76	78 1/2	74 1/2	71	78 1/2	80	82	78.6	110	111	110 1/2	110 1/2	111	111	110 1/2	H	
26.	42	60	59 1/2	60 1/2	57	57	57	60	58 3/4	59	58 1/2	60	58.1	90	91 1/2	90 1/2	90	91	90	90	H	
	70	80	76	74 1/4	77	76	79	74 1/2	71	78 1/2	80	82	78.6	110	111 1/2	110 1/2	110 1/2	111 1/2	111	110 1/2	H	
27.	60	62	89 3/4	90	92	92	94	93 1/4	89 1/2	93	94	94	92.8	101	101 1/2	100 1/2	101	101 1/4	101	100 1/2	H	
	55	75	68	66 1/2	72	70	66	66	63 1/2	72	73	72	69.9	100	101	100	100 1/2	100 3/4	100	100 1/2	H	
28.	66	62	59 1/2	60 1/2	57	57	57	60	59	58	68 1/2	66	60.4	100	101	100	100 1/2	100 3/4	100	100 1/2	H	
	65	75	68	66	71	70	73	66	63 1/2	73	74	74	71.1	101	101 1/2	100 1/2	101	100 3/4	101	101 1/2	H	
29.	52	60	59 1/2	60 3/4	56 1/2	57	57 1/2	60	58 3/4	58	58	60	58.3	100	100 1/2	100	101	100 3/4	100	100 1/2	H	
	67	72	90 1/4	89	91 1/2	92	95	94 1/4	89	93	95 1/2	95	93.3	100	100 1/2	100	101	100 3/4	100	100 1/2	H	
30.	64	66	89 1/4	88 1/2	91	91	94	92	89	91 1/2	92 1/2	93 1/2	91.7	100	100 1/2	100	101	100 3/4	100	100 1/2	H	
	60	80	68	67	71	69	73	66	63	71	73	75	70.8	100	100 1/2	99 1/2	100 1/2	100 3/4	100	100 1/2	H	
31.	65	70	83 1/4	80	83	83	84 1/2	84 3/4	80	83 1/4	85 1/2	85 1/2	84.1	90	91	90 1/2	90	90 1/2	90	90 1/2	H	
	62	65	80 3/4	80	82	82	84	83 1/4	80	82 1/4	83 1/2	84	82.8	90	91	90 1/2	90	90 1/2	90	90 1/2	H	
32.	70	88	76	74	76	76	79	75	71	78 1/2	79	80	77.4	110	111 1/2	110 1/2	111	111 1/2	110	110 1/2	H	
	54	61	59 1/2	60 1/2	58	62	58	60 1/2	60	59	59	70	60.8	110	111 1/2	110 1/2	111	111 1/2	110	110 1/2	H	

TABLE 4.—PASSENGER RUNNING DEMONSTRATIONS.—(Continued.)

Line No.	Engine truck.	Driver.		Tender.	Car										Av'g piston travel for cars.	Remarks.
		Right.	Left.		1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	9th.	10th.		
1.	6 1/4	6 1/2	7	7 3/4	9 1/2	8 3/4	8 3/4	8	8 1/4	8 1/4	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	
2.	5 3/4	6	6 1/2	7 3/4	8 3/4	7 3/4	7 3/4	7 1/2	7 1/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	
3.	6 1/4	6 1/2	7	7 3/4	9 1/2	8 3/4	8 3/4	8	8 1/4	8 1/4	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	
4.	6	6 1/4	6 1/2	7 1/4	11 3/4	10 3/4	10 1/2	8 3/4	8 1/4	8 1/4	8 3/4	9 1/4	9 1/4	9 1/4	9 1/4	
5.	6	6	6 1/2	7 1/4	10 3/4	10 3/4	10 1/2	8 3/4	8 1/4	8 1/4	8 3/4	9 1/4	9 1/4	9 1/4	9 1/4	
6.	6	6	6 1/2	7 1/4	10 3/4	10 3/4	10 1/2	8 3/4	8 1/4	8 1/4	8 3/4	9 1/4	9 1/4	9 1/4	9 1/4	
7.	6	6	6 1/2	7 1/4	10 3/4	10 3/4	10 1/2	8 3/4	8 1/4	8 1/4	8 3/4	9 1/4	9 1/4	9 1/4	9 1/4	
8.	6 1/4	6 1/2	6 3/4	6	9 3/4	8 3/4	8 1/4	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	
9.	6 1/4	6 1/2	6 3/4	6	9 3/4	8 3/4	8 1/4	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	
10.	6	6 1/2	7 1/4	7	10 1/2	10	9 3/4	8 3/4	8 1/4	8 1/4	8 1/2	9 1/4	9 1/4	9 1/4	9 1/4	
11.	6	6	6 1/2	7	8 3/4	7 1/4	7 3/4	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	
12.	6 1/4	6 1/2	6 3/4	5 3/4	10 3/4	8 3/4	8 3/4	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	
13.	6 1/4	6 3/4	7 1/4	7	10 1/2	10 3/4	10 1/4	8 1/2	8 3/4	8 3/4	8 3/4	9	9	9	9	
14.	6 1/4	6 3/4	7 1/4	7	9	8 3/4	8 1/2	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	
15.	6 1/4	6 1/4	6 1/4	6 1/4	9 3/4	8 3/4	8 3/4	7 1/2	8 1/4	8 1/4	8 1/4	7 3/4	7 3/4	7 3/4	7 3/4	
16.	6 1/4	6 1/4	6 1/4	6 1/4	9 3/4	8 3/4	8 3/4	7 1/2	8 1/4	8 1/4	8 1/4	7 3/4	7 3/4	7 3/4	7 3/4	
17.	6 1/4	6 3/4	7 1/4	7 1/2	10 3/4	10 3/4	10 1/4	8 1/2	8 3/4	8 3/4	8 3/4	9 1/4	9	9 3/8	9 3/8	4 cars L & 4 cars P equipment: P equipment on engine and tender.
18.	6	6 1/4	6 3/4	7 1/2	9	8 1/4	8 1/2	7 1/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	
19.	6 1/4	6 3/4	6 1/2	6 1/4	10 3/4	10 1/4	9 3/4	8 3/4	8 3/4	8 3/4	8 1/2	7 3/4	7 3/4	7 3/4	7 3/4	
20.	6 1/4	6 3/4	6 1/2	6 1/4	9 3/4	8 3/4	8 1/2	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	
21.	6 1/2	6 3/4	6 3/4	6 1/4	11 3/4	10 3/4	10 3/8	8 3/4	9	9	9	10 1/8	10 1/8	10 1/8	10 1/8	
22.	6 1/4	6 1/4	6 1/4	6	9 3/4	7 3/4	8	6 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	
23.	6 3/4	6 1/2	6 1/2	6 1/4	10 3/4	8 3/4	9	7 3/4	8 3/4	8 3/4	8 3/4	8 3/4	8 3/4	8 3/4	8 3/4	
24.	6 3/4	6 1/2	6 1/2	6 1/4	9 3/4	8 1/4	8 1/4	7 1/2	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	Truck brake cut in.
25.	Cut out	6 1/2	6 1/2	6 3/4	9 1/2	8 1/4	8 3/4	7	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	Truck brake cut out.
26.	6 1/4	6 1/4	6 1/4	5 1/2	11	10 3/4	10 1/4	8 3/4	9	9	8 1/2	8	8	8	8	
27.	6	6 1/4	3 3/4	5 1/2	8 3/4	7 3/4	8	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	
28.	6 1/4	6 1/4	6	5 3/4	9 1/4	8 3/4	8 1/4	7 1/2	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	
29.	6 1/4	6 1/2	6 1/2	6	11 3/4	11 1/4	11	9	9 1/4	9 1/4	9 1/4	9 1/4	9 1/4	9 1/4	9 1/4	
30.	6 1/4	6 1/4	6 1/4	5 1/2	9 3/4	8 1/4	8	7 1/2	8	8	7 3/4	7 3/4	7 3/4	7 3/4	7 3/4	
31.	6 1/4	6 1/2	6 1/2	6	10 3/4	10 1/2	9 3/4	8 3/4	8 3/4	8 3/4	8 1/2	7 3/4	7 3/4	7 3/4	7 3/4	Draw-bars bet. eng. & 1st car uncoupled at trip.
32.	6 1/4	6 1/2	6 1/2	6 1/4	9 3/4	8 3/4	8 3/4	7 3/4	8	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	

Braking Power of Cars Used in Above Demonstrations.

Nos.	Class.	Light weight.	Braking power.
		Lbs.	Per cent.
S. P. Co. 1314	Coach C. S. 201....	88,000 lbs.	79.324
" " 1316	" " 201....	88,200 "	80.93
" " 1317	" " 201....	88,300 "	80.83
" " 1354	" " 201....	89,000 "	89.12
" " 1359	" " 201....	88,800 "	89.33
T. & N. O. 32	65-ft. buffet car...	103,500 "	91.998
T. & N. O. 33	65-ft. buffet car...	102,800 "	91.998
S. P. Co. 3076	72-ft. buffet car...	105,600 "	91.998

*For cars; for locomotives it is 1,605.3 and 31.8, respectively.

†For cars; for locomotives it is 1,633.6 and 32.4, respectively.

Braking Power of Locomotive Used in Above Demonstrations.

Class	Weight on truck.	Braking power.
	Lbs.	per cent.
Class A 81 ²⁰ / ₂₈ —105.	45,000 lbs.	54.5
" " drivers	105,000 "	58.6
" " trailer	46,000 "	61.4
Empty wt. of tendr	54,850 "	88.82

that higher brake cylinder pressures can safely be used and maintained during the entire application without harmful effect in the matter of wheel heating or sliding, as no objectionable results occurred during the entire series from the improved method of using higher average brake cylinder pressures to save life or property. The object of the development along these lines is to insure greater safety to the travelling public; in other words, to supply air brake equipment for passenger trains which will, in emergency, stop the trains in the shortest possible distance. Considered in this connection, these graphical charts will be of more than ordinary interest.

EMERGENCY STOPS—80 LBS. BRAKE PIPE PRESSURE.

On Fig. 25 are shown tracings of the indicator cards taken

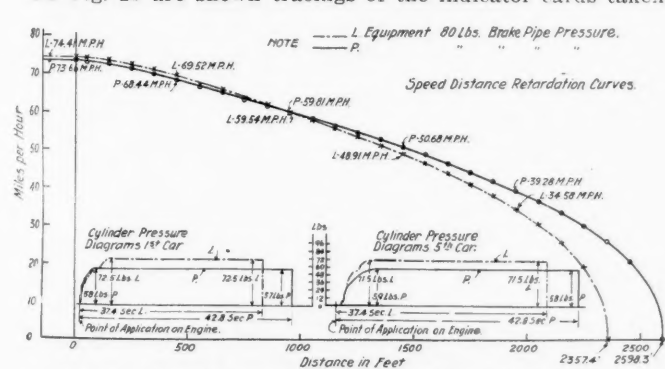


Fig. 25—Passenger Running Demonstrations.

Emergency stops; 8-car train; 80-lb. brake-pipe pressure. Schedules L and P equipments.

on 1st and 5th cars when making emergency stops with standard and improved air brake equipment using 80 lbs. initial brake-pipe pressure. It will be noted that 72 lbs. maximum cylinder pressure was secured with the improved schedule LN high-speed equipment as against 58 lbs. with the schedule P standard high-speed brake. In both instances the pressures secured were maintained throughout the stops. Comparative speed distance retardation curves have been plotted on lower portion of plate to illustrate the benefit of

using the higher average brake cylinder pressure which was secured with the improved equipment, the train being stopped from 74.41 miles per hour with the L triple valves in 2357.4 ft. as against 2598.3 ft. from 73.66 miles per hour with the standard equipment. This shortening of the stop over 240 ft. with the same initial pressure carried in brake system without any harmful results from wheel heating or sliding illus-

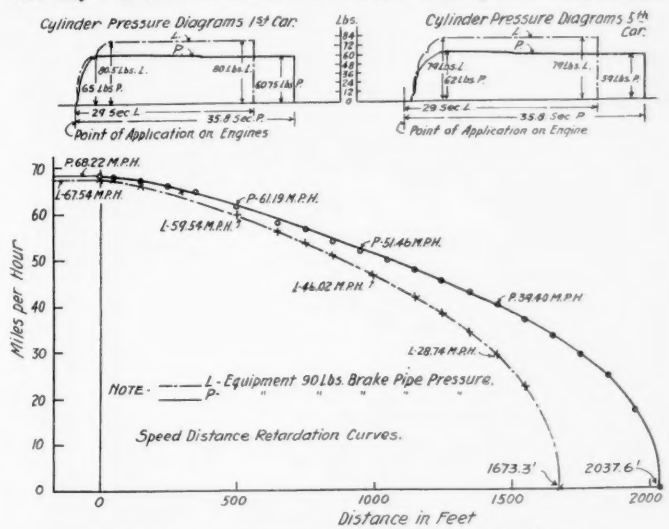


Fig. 26—Passenger Running Demonstrations.

Emergency stops; 8-car train; 90-lb. brake-pipe pressure. Schedules L and P equipments.

trates the improvement which has taken place in raising the factor of safety in air brake equipment for passenger cars by the use of the improved type L triple valves for high-speed passenger service.

EMERGENCY STOPS—90 LBS. BRAKE PIPE PRESSURE.

On Fig. 26 are shown tracings from indicator cards taken on 1st and 5th cars during emergency stops with schedules L and P equipments from 90 lbs. brake-pipe pressure. The brake cylinder pressure secured with the P triple valve was

65 lbs. on 1st car which, being above the setting of the high speed reducing valve, was reduced at end of stop to about 61 lbs., as against the initial pressure of 80 lbs. secured with the L triple valves and maintained uniformly throughout the progress of the stop. On lower portion of diagram is shown the effective result of this higher and maintained pressure in stopping of the train with the L triple valves in 1673.3 ft. as against 2037.6 ft. with the P triple valves. It will be of in-

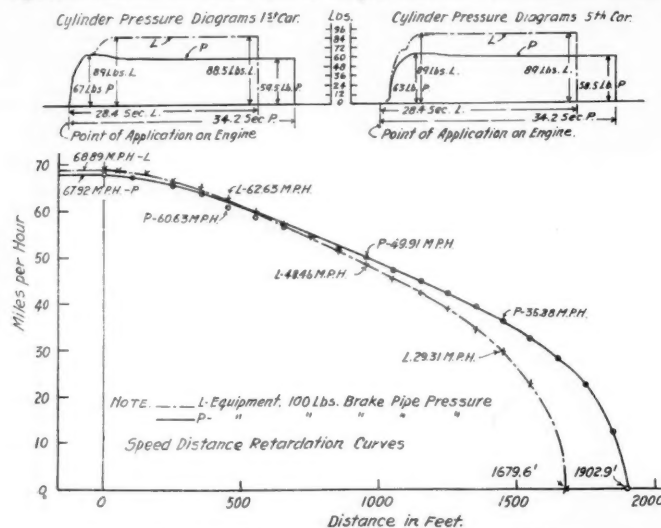


Fig. 27—Passenger Running Demonstrations.

Emergency stops; 8-car train; 100-lb. brake-pipe pressure. Schedules L and P equipment.

terest in this connection to note the graphical speed time retardation curves on Fig. 30, which have been plotted from this same pair of runs.

EMERGENCY STOPS—100 LBS. BRAKE PIPE PRESSURE.

On Fig. 27 are shown further comparisons of the higher brake cylinder pressures secured from the same initial brake-pipe pressure with the L triple valves, 100 lbs. initial brake-pipe pressure being used during the pair of runs shown on this figure. A similar shortening of stop was made with the L triple valves to the results represented on the preceding figures, the stop being made from 68.9 miles per hour with the

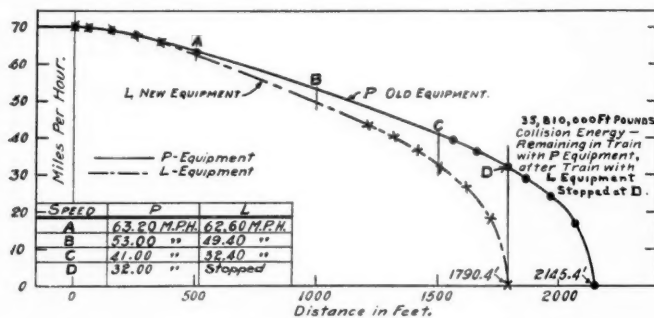


Fig. 29—Passenger Running Demonstrations.

Speed-distance retardation curves. Emergency stops; 8-car train; 90-lb. brake-pipe pressure. Schedules L and P equipments.

L triple valves in 1679.6 ft. as against 1902.9 ft. from 67.9 miles per hour with the P triple valves.

EMERGENCY STOPS—90 LBS. BRAKE PIPE PRESSURE WITH L AND 110 LBS. WITH P TRIPLES.

On Fig. 28 are shown the results of a pair of runs which were made to illustrate the comparative results which can be secured by the use of 20 lbs. less initial brake-pipe pressure with the Schedule L improved high-speed equipment, from which similar brake cylinder pressures were secured as with 110 lbs. initial brake-pipe pressure with the P triple valves. The brake cylinder indicator diagrams on upper portion of figure, which are actual tracings of the cards taken on this pair of runs, show the effective pressure areas used during the stop and the speed distance retardation curves given on lower portion of plate illustrate that the use of the L triple valve

makes it possible to carry 90 lbs. maximum pressure in the brake system, and at the same time have equal or slightly improved factor of safety as against the standard high-speed air brake equipment carrying 110 lbs. maximum pressure.

On Fig. 29 is shown, for graphical representation of the comparative factors of safety in both types of equipment, a pair of runs which have been reduced to a uniform speed of 70 miles per hour using 90 lbs. brake-pipe pressure, these curves being plotted to show speed at any given point during progress of the stop, and in the lower left-hand portion of plate is shown the speed at points A, B, C and D, from which it will be noted that the train would be at rest at point D (1790.4 ft.) with the schedule L equipment, and the train at

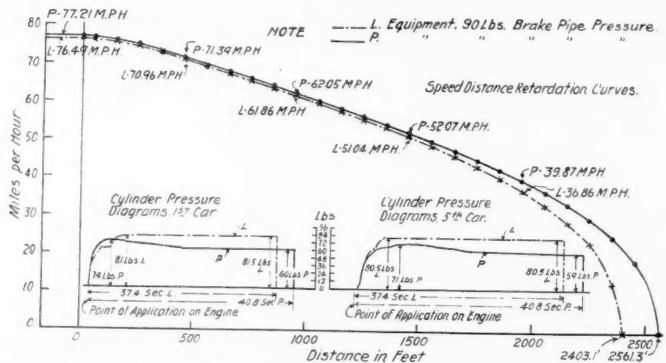


Fig. 28—Passenger Running Demonstrations.

Emergency stops; 5-car train; 90-lb. brake-pipe pressure with schedule L; 110-lb. with schedule P equipment.

this point would still be running at the rate of 32 miles per hour with the standard equipment. The collision energy remaining in the train at this speed would be 38,810,000 ft. lbs. This graphically represents why disastrous rear-end collisions occur even at comparatively slow speeds, and also illustrates the improved factor of safety which is secured by the shortening of the stops through the use of improved air brake equipment.

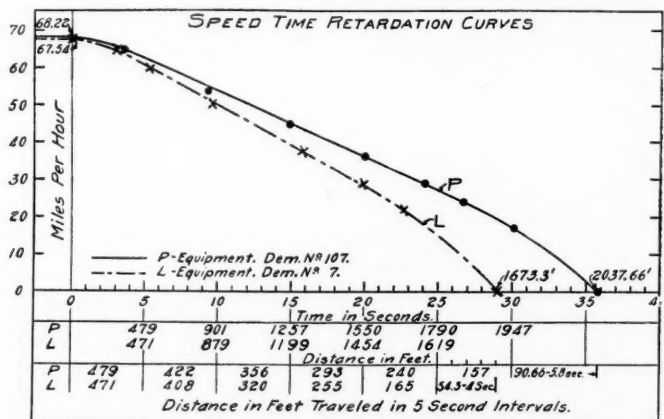


Fig. 30—Passenger Running Demonstrations.

Emergency stops; 8-car train; 90-lb. brake pressure. Schedules L and P equipments.

The comparative curves, which have been shown on the preceding plates of emergency stops, have been plotted to illustrate the speed at any given distance in feet during the progress of the stops, but as it would be of considerable interest to be able to appreciate the speed of train at any given period of time during the stop as well as at any given distance, a pair of curves have been plotted to show the comparative speeds of trains through the time periods of stops made with both equipments.

On Fig. 30 is shown this pair of speed time retardation curves, and for ready observance of the speed at any distance, as well as the time, the distance in feet is shown on lower portion of plate.

These curves are made from the same runs as the speed distance curves on Fig. 26.

TABLE 5.—PASSENGER RUNNING DEMONSTRATIONS.
Service Applications of Westinghouse Improved and Standard Air-Brake Equipment, with 8-Car Train of Passenger Equipment—Western Division of Southern Pacific Company.

Brake-cylinder pressure, lbs.														Aux. res. pressure in lbs. of car														Time of gage readings.		Remarks.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
En- gine.				1st in- dicator.				2d.				3d.				4th.				5th.				6th.				7th.				8th.				Before application...	After application...	L	Graduated release	See Plate 37.	P	3 applica- tion stop.	L	Graduated release	See Plate 37.	P	2 applicat'n	stop. See Plate	No. 37.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1st.	2d.	3d.	5th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.															1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.	4th.	5th.	6th.	7th.	8th.	1st.	2d.	3d.

The rate of retardation during the different portions of the stop, as indicated by the figures given, showing the feet traveled during each second in different parts of the stop.

The end desired is to stop in the shortest possible distance and at the same time to have the stop progress with as uniform rate of retardation as possible.

It will be of more than ordinary interest to note the uniform rate of retardation secured with the improved equipment, notwithstanding the greatly shortened time and distance of stop.

SERVICE STOPS—EFFECT OF IMPROVED CONTROL OF BRAKE CYLINDER PRESSURES DURING SERVICE APPLICATIONS.

On Table 5 and Fig. 31 are shown the results secured from the use of the different control of brake cylinder pressures during service applications with the standard and improved equipment, as described on Figs. 19, 20 and 24. Comparative runs were made with both types of equipment at similar speeds, and the stops were made with the standard equipment by the usual method of graduating the pressure into the brake cylinders, releasing during the progress of the stop and making a second or third application to complete the stop and hold the train at rest. With the L equipment the pressure was placed into the brake cylinders in one graduation, and

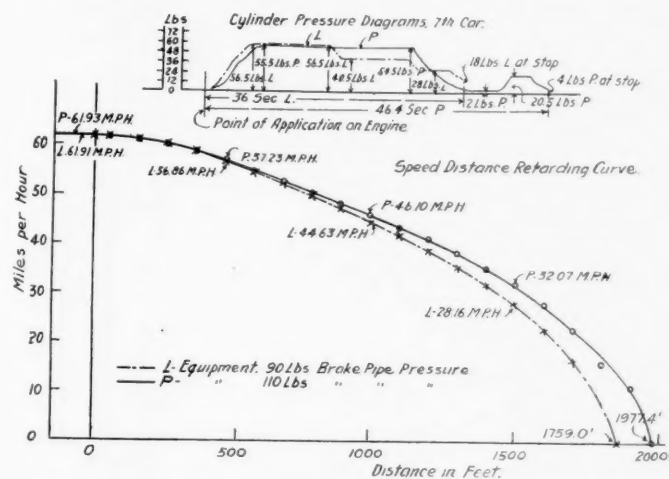


Fig. 31—Passenger Running Demonstrations.

Effect of control of brake-cylinder pressure during service stops with L and P equipments.

the stop was completed by the use of the graduated release feature. Table 5 shows the speeds, pressures, lengths of stops, and general data secured during this demonstration. On Fig. 31 will be found the graphical illustrations of the brake cylinder pressures taken from the indicators on 7th car, showing the complete control of cylinder pressures and the use of the graduated release feature of the L triple valves, as compared with the complete release and reapplication to complete the stop with the P triples. On the lower portion of Fig. 31 are shown the comparative speed distance retardation curves, from which it will be noted that, by the use of the same maximum cylinder pressures with both equipments, the stop was made over 200 ft. shorter with the improved equipment. These results are very important when considered in connection with the necessity for making a large number of stops in suburban traffic on short schedule, and at the same time controlling the train smoothly, especially where a standing load is carried during rush hours. A train equipped with L triple valves can be run in local service with a larger number of stops on a shorter schedule than would be possible with standard equipment.

CONTROLLING TRAINS ON 2 PER CENT. GRADE.

On Table 6 are shown the data collected from comparative demonstrations made on 2 per cent. grade between Zeta and Rocklin, Cal., with the improved and standard equip-

ment to illustrate the pressures, brake cycles and speeds with the two equipments. 110 lbs. brake-pipe pressure was used with the standard and 90 lbs. with the L equipment. The heavier average brake-pipe reductions, the longer brake applications (cycles), the heavier brake cylinder pressures, and

TABLE 6.—Passenger Running Demonstrations—Controlling Trains on 2 Per Cent. Grade between Zeta and Rocklin, without Retaining Valves with Schedules L and P Equipments

	P equip- ment.	L equip- ment.	Gain for L, per ct.
Demonstration number	306	307	....
Average speed, miles per hour	21.9	24.3	....
Governor setting, maximum, lbs.	140	140	....
Governor setting, minimum, lbs.	130	110	....
Main reservoir pressure, maximum, lbs.	140	139	....
Main reservoir pressure, minimum, lbs.	127	114	....
Feed valve setting	110	90	....
Average brake-pipe pressure:			
Before application, lbs.	106.5	89.1	....
After application, lbs.	94.6	82.2	....
Average brake-pipe reductions, lbs.	11.9	6.9	42
Average length of Cycles, seconds.	42.6	59.5	39.7
Total number of applications.	42	26	38.1
Average maximum brake-cylinder pressure:			
Engine, lbs.	12.2	20.5	....
Tender, lbs.	41.6	23.6	....
First car.	31.5	23.2	....
Piston travel first buffet car: At start, in.	6¼	5¾	....
At finish, in.	7	6½	....

Make-Up of Train.—Engine, 3026, dynamometer car and eight passenger equipment cars.
Grade Zeta to Rocklin, 7 miles, 2 per cent.; and 4 miles averaging 0.83 per cent.

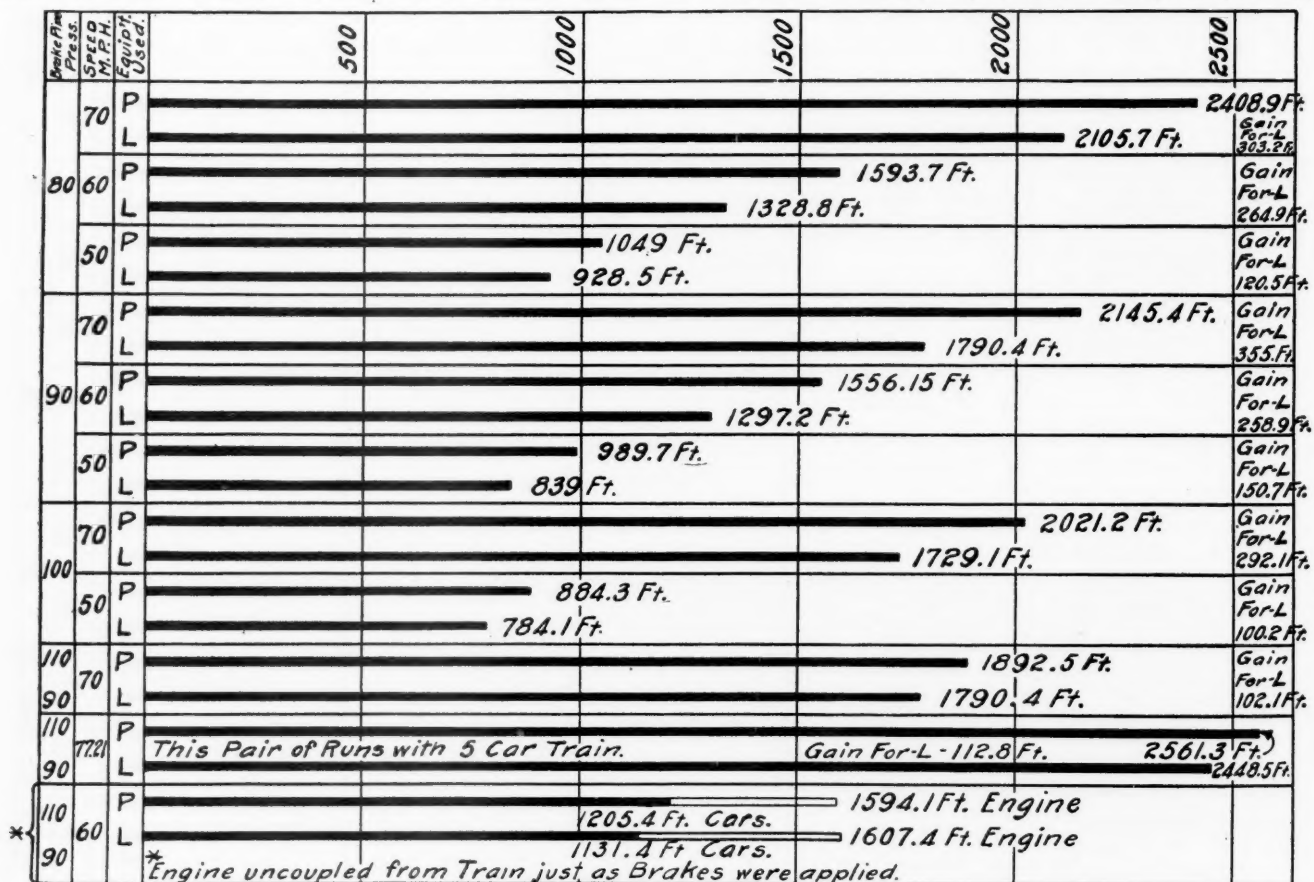
the larger number of total brake applications with the P equipment as compared with the L. The improved results shown by the L equipment are brought about by the use of the graduated release feature, the quick recharge, and the additional stored volume, as by the use of graduated release

CHARACTERISTIC BRAKE CYLINDER PRESSURE DIAGRAMS TAKEN ON 2 PER CENT. GRADE.

On Fig. 33 are shown the interesting tracings of chronograph records from the comparative runs made on 2 per cent. grade between Zeta and Rocklin, Cal., the official data for which is given on table 15, to illustrate the new and old methods of controlling passenger trains on grades. On upper portion of plate is shown the tracings of brake-pipe and brake cylinder pressure records made by the chronograph of the P equipment. The variations of brake-pipe pressures are interesting as well as the brake cylinder pressure curves, the latter illustrating the intermittent use of brake cylinder pressures on account of the complete release which occurs with standard equipment. On the lower portion of the plate is given similar tracings of brake-pipe and brake cylinder pressure records made by the chronograph on the comparative run with L equipment, and it will be noted that the brake-pipe pressure was practically uniform throughout, as, on account of the graduated release feature of the L triple used to secure the uniform brake cylinder pressure shown, it was unnecessary to make such heavy deductions from the stored volume. The record of the performance of the L equipment illustrates the uniform results which can be secured, and indicates the possibility of handling heavy passenger trains on mountain grades without the use of retaining valves, as it is shown that the control of brake cylinder pressures is placed entirely in the hands of the engineer with the L triple valves.

PASSENGER RUNNING DEMONSTRATIONS—SAFETY RESERVE FEATURE.

A run on 2 per cent. grade between Zeta and Rocklin, Cal., was made to illustrate the automatic safety reserve feature



pressure, the latter then lapping the triple valves, retaining approximately 35 lbs. pressure in the brake cylinders, and, there being no excess pressure to secure release of brakes, the train was automatically stopped on the grade and held at rest until pump was started and main reservoir pressure replaced. This important demonstration illustrates the impossibility of a train running away on grade when equipped with L triple valves, as the stored volume can only be reduced to the point where the pressure in the supplementary reservoirs prevents further release of brakes, causing the pressure remaining in the brake cylinders to automatically stop the train, this being beyond the control of the engineer.

SUMMARY.

The results of the different series of tests of the passenger equipment, as shown on the preceding pages, fully demonstrate the existence of the improvements and refinements in L triple

3. That the quick service feature of the L triple valve makes it possible to secure prompt and efficient brake applications with the least possible deduction from the stored volume.

4. That there are many advantages secured from the use of the quick recharge and the additional stored volume of pressures with the schedule LN equipment, resulting in a very much higher factor of safety.

5. That the securing of higher brake cylinder pressures from any given initial pressure with the L triple valve makes it possible to carry less initial brake-pipe pressure and still secure the same, or even better, factor of safety as at present with standard equipment and 20 lbs. higher initial pressure.

[In the article on the Southern Pacific Air Brake Tests in our issue of December 4, page 1477, the name of the General Air Brake Inspector of the Southern Pacific is given as H. H. Young. This should read H. H. Forney, and we are advised

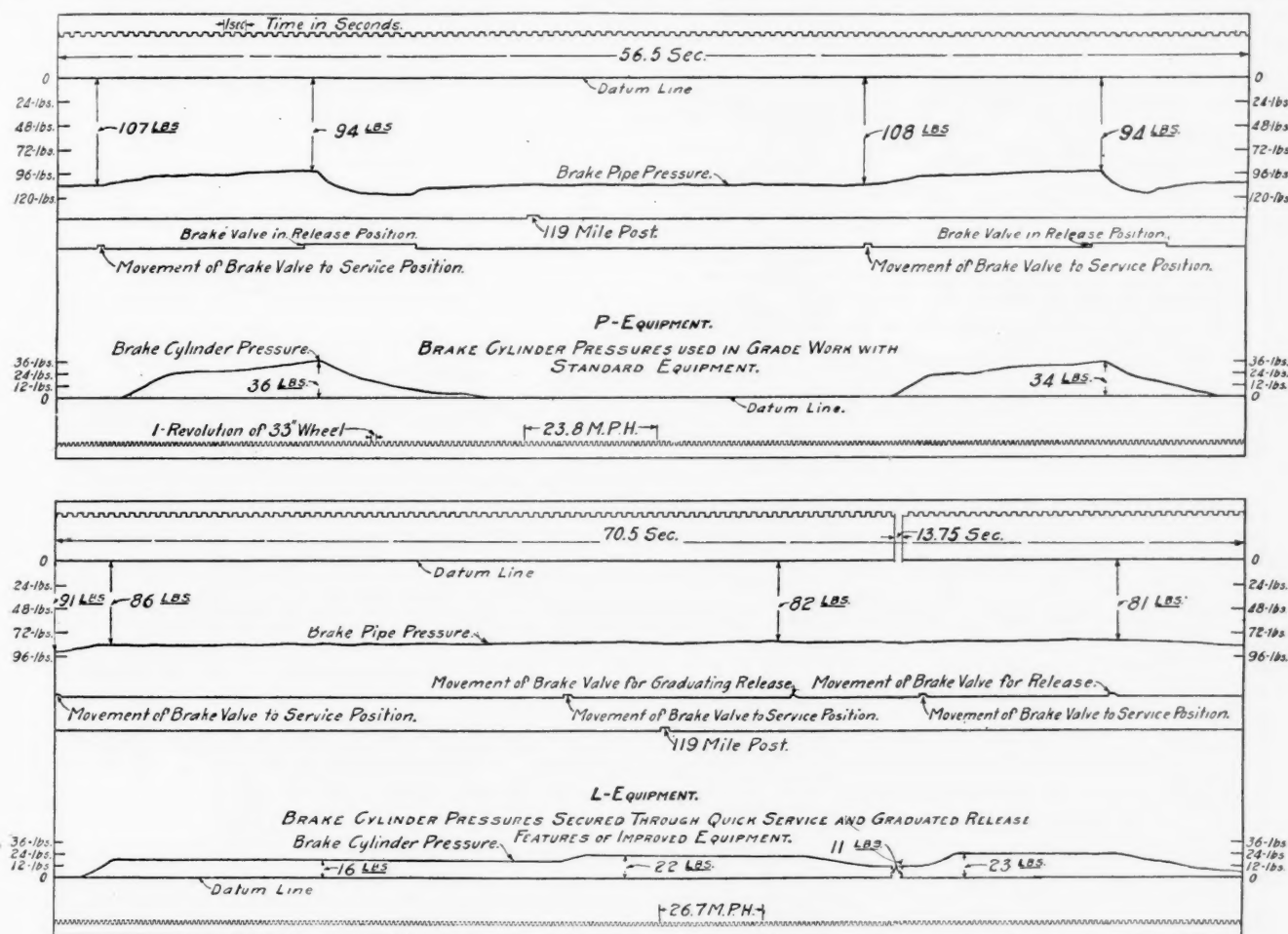


Fig. 33—Passenger Running Demonstrations.

Characteristic brake cylinder pressure diagrams taken on 2 per cent. grade from Zeta to Rocklin, Cal. Chronograph record with Westinghouse improved L and standard P air-brake equipment.

valves, have illustrated the necessity for these improvements by showing the results which are ordinarily secured from the use of the standard equipment, and shown some of the benefits to be derived from the use of the improved equipment, as follows:

1. That higher emergency brake cylinder pressures are secured with the L triple valves from any given initial brake-pipe pressure with the result that a greatly increased factor of safety is secured in the stopping of high-speed passenger trains in the shortest possible distance.

2. That the use of the graduated release feature of the L triple valves, placing the control of brake cylinder pressures completely in the hands of the engineer during release as well as application of the brakes, makes it possible to control passenger trains with the greatest flexibility.

that to him much credit should be given for the thorough tests and the clear and comprehensive report showing the results of the tests. It should also be mentioned that the demonstrations were under the general direction of H. J. Small, Superintendent of Motive Power of the Southern Pacific, who was constantly represented by either T. W. Heintzelman, Superintendent of Motive Power of the Northern district of the Southern Pacific, or P. Sheedy, Superintendent of Motive Power of the Southern district. An idea of the large importance of these tests will also be gained by the fact that A. L. Humphrey, General Manager of the Westinghouse Air Brake Company, spent almost the entire summer from May until September on the Pacific coast, giving general supervision to the work of the tests for his company.—EDITOR.]

RAILROAD ACCOUNTING AND THE HEPBURN LAW.

BY ARTHUR C. GRAVES, M.A.
New Haven, Conn.

II.

It would seem as if the reports of the physical and financial operations of our great railroads have been perfected to such a degree that what remains to be done can only be wisely accomplished by a gradual development through the experience of those trained in the work. With respect to railroad accounting at least nothing remains to be accomplished through the interference of the government either by law or by action of commissions, with the exception, perhaps, of the one feature of uniformity which we shall consider later. Indeed, of all the great industries of this country, the one which represents in its most highly developed form the principle of publicity of corporate accounts is the transportation industry represented by our great railroad companies. Not even the banking industry, under the examination of national or state inspectors, publishes a statement of its financial standing in such an intelligent and complete form as do the railroads. Perhaps the most wholesome and creditable feature of this condition of affairs is that the publicity of railroad accounting has been brought about almost wholly through the initiative and voluntary acts of the companies. Heretofore, the provisions of state or federal law regarding railroad accounting have all been of a very general nature leaving the character, method, substance and details of the accounts to the needs, adaptability and sense of responsibility of the individual company and its managers.

The Interstate Commerce Law of 1887, which created the Interstate Commerce Commission, authorized that commission to require annual reports from all common carriers. As we have heretofore explained pretty well the main provisions and the information contained in the annual report, we will not stop to explain this clause of the Interstate Commerce Law. This in substance provided for information which the annual railroad report already conveyed. The monthly report, let us notice, giving gross and net earnings, was never required. It represents in its essential form the voluntary act of the companies performed to enlighten the public and their stockholders.

UNIFORMITY UNDER HEPBURN LAW.

Let us now examine what changes have been wrought in the field of railroad accounting by the adoption of the Hepburn Law. In reference to the requirements of the railroads to publish annual reports and the contents of such reports, the act seems to be exactly like the old Interstate Commerce Act. Since it is believed that the railroads have perfected their system of accounting and annual reports considerably in advance of the specified requirements this feature of the law need receive no further attention.

The Hepburn Act further authorizes the Commission "in its discretion * * * to prescribe a period of time within which all common carriers shall have, as near as may be, a uniform system of accounting * * *." It does not seem to be generally appreciated that the old law contained just this provision, save that the qualifying words leaving it to the discretion of the Commission plainly indicated that the framers of the old act had serious doubts whether it was "practicable to prescribe such uniformity and methods of keeping accounts." Though the old law prescribed uniformity, yet only in a very general and incomplete way has it ever obtained among our different railroad systems. The Interstate Commerce Commission, except at rare intervals issuing tentative suggestions which it did not endeavor to have followed, never acted under the old law. The railroads were left to make up and compile their own returns and statistics according to that method which seemed best adapted to their own needs and conditions.⁷ To whatever extent uniformity

⁷ In some cases returns were compiled as directed by the laws of the state under which the company was organized.

prevailed it was through the natural development of railroad accounting. Our criticism in this matter would not be of the principle of uniformity nor of the law prescribing it, but of the attitude of the Interstate Commerce Commission. For 20 years the Commission neglected to act. In reply it may be said that the Commission had not under the old law the same power of prescribing the very books and accounts to be kept by every carrier, and of compelling enforcement of its orders. But this stand, we think, is not well taken. Indeed, it seems a little disingenuous. The first of these powers is both unnecessary and unwise; and the exercise of the second is most unwise in this connection, because it is destructive of co-operation. History shows that the railroads have never been disposed to disobey positive instructions of the Commission except when they were arbitrary and unreasonable. The Commission had the opportunity for 20 years to co-operate with and guide the railroads in a spirit of moderation and wisdom, and it did nothing.⁸ In that time a great advance could have been made, and the present abrupt change and confusion greatly relieved, if not avoided.

Nor can any sound objection be made to a reasonable degree of government regulation in this matter. In fact action by the federal commission to bring about uniformity in railroad accounting (if indeed uniformity is practicable) is probably necessary to bring all the roads together in harmonious action and to guide or direct them.⁹ But governments should learn to act with moderation and conservatism, particularly when interfering in business and industrial affairs. The less governmental interference with the administrative affairs of a railroad the greater the efficiency and economy of operation. If the advanced views of some of the present leaders of the Republican party concerning "thorough-going and complete control"¹⁰ of our interstate carriers should ever obtain in this country, it would sound the death knell of the superiority and efficiency of the American railroad system.

(To be continued.)

FOREIGN RAILROAD NOTES.

The August gross earnings of 59 railroads in Germany decreased by 1 per cent., the receipts from freight decreasing about 4 per cent., and the passenger receipts increasing about 5 per cent.

The railroad from Tientsin (the port of Peking) south by east to Nankin, which is an undertaking of the Chinese government, was begun June 30. The northern half of it has a German engineer, Dormmüller; and the southern half an English engineer, Turkey. The government general manager for the whole enterprise is Lu-hai-huan.

It has been proposed to advance freight rates 10 per cent. generally on the Russian railroads, the deficit of the State Railroads having increased from \$10,455,000 in 1903 to \$21,800,000 in 1904, \$42,600,000 in 1905 and \$58,500,000 in 1906. But as many industries are also in a suffering condition, and an advance in freights might cause an important reduction in the amount of traffic, the proposition has been rejected for the time, and it is not probable that a general horizontal advance will be made.

⁸ The serious feature of this matter would seem to be that the records of Congress and historical incidents show that the Interstate Commerce Commission has been constantly demanding a wider range of power, both by direct appeals to Congress itself and also by personal pleading and interviews with individual senators and representatives. Had it been content to live up to its duties, under the law as it was laid down, which gave it ample power, many of the abuses in the railroad world would have been better checked and the railroad problems of to-day far less serious.

⁹ In view of the present attempts of the federal commission to bring about uniformity of course any action by the state commissions is most unwise and destructive of economical accounting. The recent action of the up-state Public Service Commission in New York, for instance, in reference to annual reports of its railroads, is one of the most arbitrary and unreasonable stands yet taken by a state commission in the history of this country.

¹⁰ See the addresses of President Roosevelt at St. Louis, Cairo and Memphis, October 2, 3 and 4, 1907.

General News Section.

On December 10 the last strand of the cables for the Manhattan Bridge across the East river, New York, was strung. This work has been under way since August 10.

A bill has been introduced in Congress by Senator LaFollette, of Wisconsin, to create a public utility commission of three members, for the District of Columbia, to regulate public service corporations.

The Attorney-General of California has drafted a bill, to be presented to the legislature, providing for the reorganization of the state railway commission, with extensive powers like those of the New York State Public Service Commission.

Some telegraphers at Indianapolis, members of the Order of Railroad Telegraphers, have started a movement to secure legislation in Indiana to prohibit train despatching by telephone on the ground that it is a menace to the life of employees and passengers.

A bill to establish three state colonies for tramps will be introduced at the next session of the New York Legislature, and its promoters, Edmund Kelly, R. Fulton Cutting, Robert W. de Forest, Robert W. Hebbard, Commissioner of Charities, and Samuel J. Barrows, say that it will have the support of the railways.

The management of the Missouri Pacific has announced that it will make those improvements in the state of Kansas estimated to cost about \$1,000,000 which have been recommended by the Kansas Board of Railroad Commissioners; and that the work of making these improvements will begin at once and will continue without intermission, weather conditions permitting.

Near Hilliard, Wash., on the morning of December 10, east-bound train No. 4 of the Great Northern was stopped by robbers, who detached the engine, mail car and baggage car and ran them forward some distance. By mistake they did not take the express car, and therefore missed the principal booty which they were after. According to the press despatches, their failure to take the express car was due to the quick wit of fireman Perrin, who deceived the robbers by separating the train ahead of the express car instead of behind it, as they had ordered.

From a bulletin issued by the Department of Commerce and Labor at Washington it appears that from 60,000 to 100,000 Mexicans come into the United States each year to get work. Most of these men perform the lowest class of labor, and usually they do not stay more than six months. Some come as far north as St. Louis and Chicago, but most get no farther than Texas or California. The emigration of these Mexicans to the United States and their subsequent return has affected the standards of living and the rates of wages in Mexico, tending to raise both.

Conductors on the Chicago & North-Western, the Chicago, Milwaukee & St. Paul and the Wisconsin Central, in Wisconsin, are circulating petitions to the legislature for the passage of a law requiring passengers to pay 3 cents a mile when they pay cash fares on trains. This legislation would be similar to the law of Illinois, where, as in Wisconsin, there is a 2 cent fare law, but where, unlike Wisconsin, passengers who pay fares on trains are charged 3 cents per mile. It is said that about 20 per cent. of the passengers in Wisconsin pay cash fares on the trains. An instance is given where on one train the conductor received 18 cash fares from a total of 27 passengers. The railways in Wisconsin are allowed to charge 10 cents extra where fares are paid on trains, but as a rebate slip must be given for this the penalty is ineffective.

The Chicago & North-Western and the Union Pacific lines have reduced by 2 hours and 25 minutes the schedule time of their through passenger trains between Chicago and Portland. Train No. 3 will continue to leave Chicago daily at 10.45 p.m. and Omaha at 4.10 p.m. (train No. 5), and will reach Pocatello at 5.05 a.m.; Huntington at 4.55 p.m., and Portland at

7.20 a.m. instead of at 9.45 a.m. This change is undoubtedly made to meet competition of the Hill lines, due to the establishment of through train service over the Spokane, Portland & Seattle, between Spokane and Portland. The principal change eastbound is in No. 2, which will leave Portland at 9.15 a.m. instead of at 8.30 a.m., and will arrive at Chicago as at present. The Oregon Railroad & Navigation has reduced the time of the principal train between Spokane and Portland.

The five ferry lines owned by the New York Terminal Co., and plying between New York and Brooklyn, stopped running on Monday morning last, on only a few hours' notice. The lines which are discontinued are not the most important ones on the East river, and their business has been greatly diminished by the bridges and tunnels which have lately been opened. In the case of one of the ferries, the action of the company was taken in direct contravention of an order of court. The city government will endeavor to compel resumption of business, probably under a temporary contract to the effect that the company shall start up the ferries again and that the city will pledge itself not only to make up any deficit from operation, but also to guarantee the payment of the interest on the mortgage bonds for the time the contract is in force.

George W. Kanavel, Chairman of the Kansas Board of Railroad Commissioners, has issued a statement outlining the legislation that he thinks should be passed by the state legislature this winter affecting railways. Among his suggestions are the following: That the railway commissioners should be made appointive instead of elective; that orders of the Commission should be made effective forthwith and pending appeal; that all railways should be required to give the Commission detailed reports of wrecks; that the reciprocal demurrage law should be amended to provide that charges for storing freight shall be 5 cents a ton instead of 5 cents per 100 lbs.; that the Commission should be given jurisdiction over the heating, lighting, ventilation and sanitary arrangements of railway shops and offices; and that the Commission should be given jurisdiction over telephone and telegraph lines and electric street and interurban railways.

The New York State Public Service Commission, Second district, has compiled a directory of corporations under its supervision. There are 848 corporations, municipalities and individuals engaged in serving the public in some capacity that by operation of law have been placed under the supervision of the commission. There are shown 192 steam railway corporations, of which 76 are operating roads 91 lessor, 24 inchoate or dormant, and one individual operating a road. The street railway corporations are 139, of which 80 are operating, 42 not operating, either inchoate or dormant, and 17 lessor not operating. There are seven express companies, one sleeping car company, 38 coal gas and water gas corporations, 311 electrical corporations and plants, 48 coal gas and water gas and electrical corporations, 55 natural gas corporations and plants, four electrical and natural gas corporations and 53 acetylene gas or gasolene gas corporations and plants. There are 47 electrical plants operated by municipalities and three acetylene or gasolene plants.

State Regulation—Fresh Every Hour.*

The New York State Public Service Commission, First district (New York City), has issued an order to the New York Central that freight trains must not be run through Eleventh avenue in the rush hours and in the hours when school children cross the tracks. The order directs that no freight trains shall be operated between the hours of 10 a.m. and noon on Sunday and on all other days of the week none between 6.40 and 7.20 a.m., between 8.15 and 9 a.m., between 11.50 a.m. and 12.55 p.m., between 2.50 and 3.10 p.m., between

*With apologies to the candy stores.

4.45 p.m. and 5.15 p.m., and between 5.45 and 6.15 p.m. In case of adverse weather conditions the company may operate trains within the prohibited periods, but only by giving an hour's notice in advance by telephone to the commission's bureau of complaints and accidents.

Findings of a Union Pacific Board of Inquiry on a Collision.

The results of an inquiry regarding a wreck on the Union Pacific, which was made by some of the highest officers of the Harriman Lines and by some distinguished citizens, have recently been made public. The wreck took place at Borie, Wyo., on the Union Pacific November 10. Train extra 223 east, 31 cars, 1,451 tons, became uncontrollable near Ozone, Wyo., and collided on an 85-ft. grade between the switches at Borie with work extra 1508. As a result of the collision ten persons were killed and two were injured. All the killed and injured were employees of the company, the killed including the enginemen of both trains, the conductor of the work train and brakemen on both trains. The accident was first investigated by a board which besides officers of the road included two bankers. This board recommended that W. H. McCormick, conductor, and E. R. Tracy, brakeman of extra 223, be dismissed from the service. There being some criticism of the action of the company a second board was convened, composed of the following: Charles C. Hughes, General Superintendent Chicago & North-Western, retired; George M. Randall, Major-General, U. S. A., retired; Frank D. Baldwin, Brigadier-General, U. S. A., retired; W. B. Scott, Assistant Director of Maintenance and Operation, Union Pacific and Southern Pacific; H. H. Forney, General Air-Brake Inspector, Southern Pacific; A. L. Mohler, Vice-President and General Manager, Union Pacific; W. L. Park, General Superintendent, Union Pacific.

This board examined all employees concerned in or having knowledge of the handling of extra 223, and from testimony by experienced engineers firemen, conductors, brakemen and car inspectors of the Fifth district of the Wyoming division of the Union Pacific, found that this train left Laramie and passed Buford in normal condition, which was held to support the findings of the first board that investigated the cause of the accident which were as follows:

"After having heard the testimony of Conductor McCormick, Brakeman Tracy of Extra 223 East, Engineer Clinton, and Fireman Hansen on Work Extra 1508, which were in collision at Borie at 7:40 p.m., November 10th, 1908, we have reached the following conclusion:

"As the evidence shows, leaving Buford, Extra 223 had a train line air pressure of 90 lbs.; at a point between Ozone and Buford this pressure was reduced to 40 lbs.; the conductor having stated that frequent applications and releases of air had been made without the necessary time being allowed for the train line to recharge, we believe that the accident was caused by the improper manipulation of air by engineer Schley on Engine 223, which resulted in his not having the necessary pressure to control the train when the emergency arose."

The second board of inquiry further found that had prompt and proper response been given by the crew with hand brakes the speed of the special train would have been checked and controlled in ample time to have prevented the accident.

Waivers of Damage Rights Illegal.

Justice Stafford, of the Supreme Court of the District of Columbia, has decided, in the case of Goldenstein, that an employee of a railway injured in the service of the company cannot barter away his rights under the employer's liability act by signing a contract as in the case of a relief organization, that he shall receive only a certain amount as damages in the event of injury occurring to him in the course of employment. While the United States Supreme Court has ruled that the employer's liability act is generally unconstitutional, the Court of Appeals of the District of Columbia has recently ruled that it nevertheless applies in its entirety to the District of Columbia, Congress having supreme jurisdiction over the district and the territories. Justice Stafford in his opinion likened an employee signing a receipt for benefits received from an association to a borrower agreeing to pay usury, and adds: "The borrower may still recover back the usurious payment; so may the employee repudiate his release of his real damages." The court added that the supposi-

tion is that the employee assents to the association contract under the stress of his situation by reason of his necessity to secure employment.

A Chance for the Interstate Commerce Commission.

The establishment to-day of an animal quarantine by Prescott, Ontario, has placed Edward Hammell, of Morrisburg, Ontario, in a peculiar position. Hammell recently rented a farm near Ogdensburgh, New York, and with his son and five horses came over to work it. He demanded free entry to the United States on the ground that he was an immigrant, but the customs authorities required him to pay the head tax and duty on his horses. This Hammell refused to do, and started on his return to Canada. At the frontier, however, he was stopped by the Canadian authorities, who, although Hammell had been out of Canada less than an hour, demanded that his animals be subjected to a thirty-day quarantine.—Press despatch from Ogdensburgh.

Texas Full-Crew Law Nullified.

The Texas Supreme Court on December 9 held the "full-crew" act of the state, requiring a certain number of men on each train, to be unconstitutional. The decision was rendered on an appeal from the Travis County District Court which had fined the Missouri, Kansas & Texas \$2,000 for violation of the act. The title of the act was, "An act to protect the lives and property of the traveling public and of the employees of the railways in the state of Texas." The court held the act void because it was in violation of a provision of the state constitution that the subject of a law must be expressed in its title. "A title so general as that of this act," the court said, "gives no intimation of the particular subject to which the body of the act is confined."

The Latest Instruction Car.

Acting on the suggestion of Past Assistant Surgeon Colby Rucker, of the Marine Hospital service, the California State Board of Health proposes to provide a car for traveling lecturers to instruct the people of the state in hygiene and the prevention of disease. Dr. Rucker's idea is to install an exhibit showing how fevers, tuberculosis and other diseases may be prevented. It is said that the Southern Pacific Company has provided a car and that both the Southern Pacific and the Santa Fe will transport the car and its managers free over their lines in California.

Telephones for Train Despatching.

The Union Pacific is erecting a telephone line to be used in train despatching from North Platte, Neb., westward to Sidney, 123 miles. This line is all single-track and is equipped with automatic block signals. At the three sidings where there are no stations booths are to be erected in which there will be telephones, available for the use of conductors, who can thereby call upon the dispatcher for instructions whenever necessary. Each of these booths will have a train order signal, connected electrically with the dispatcher's office, so that he can at any time put the signal in the stop position for the purpose of stopping a train. These train-order signals will be kept lighted night and day, acetylene lamps being used.

The New York Central, which has for some time used telephones for train despatching between Albany and Syracuse, is installing apparatus for the extension of the telephone despatching system from Syracuse to Buffalo, about 150 miles.

The Erie is putting up a telephone line for use in train despatching between Meadville, Pa., and Corry.

The Great Northern has telephones installed for train despatching on the Minot division from Devil's Lake to Williston, 239 miles, and the telephone system is to be extended from Williston to Culbunk, Mont., over the Montana division, 437 miles, and also on the Butte division, 507 miles. As the Great Northern is now despatching the trains on its

The telephone service on the Erie & Ashtabula division of the Pennsylvania Lines is to be improved. Every office is to be equipped and a central operator will be put in charge.

We submit the following classification:

<i>Personal Injuries to Employees Not Due to Train Accidents.</i>	
Due to faulty judgment of the injured employee (trainmen)....	236
" " " " " " trainmen other than those injured..	71
" " " " " " injured employee other than trainmen	164
" " " " " " employees other than trainmen caus-	
ing injury to their fellow-employee.....	19
Unavoidable accidents	340
Unknown	20
Error in judgment	1
Violation of rules, trainmen injured	4
Violation of rules, other employees than trainmen injured.....	4
Employees injured by outsiders	2
Defective track	4
Defective equipment	38
Caused by unknown parties.....	6
Carelessness of employees (electric line),	1
Acts of God	2
<i>Personal Injuries to Passengers Not Due to Train Accidents.</i>	
Due to passengers' own carelessness	54
Due to employees	10
Unavoidable	8
Due to defective equipment.	6
Unknown	2
Due to carelessness of electric line employee.....	1
Acts of God	2
Caused by unknown persons.....	3
Intoxication of passenger	1
<i>Injuries to Electric Line Employees and Employees of Express, News and Pullman Companies.</i>	
Due to their own carelessness	6
Unavoidable	1
Due to carelessness of railway employees	1
Personal injury to trespassers not caused by train accidents....	331
Personal injuries at highway crossings (3 of these were suicides)	92
<i>Train Accidents, in Which No One was Injured.</i>	
Due to violation of rules	27
Due to faulty judgment of employees	58
Due to defective equipment	44
Unknown	9
Error in judgment	2
Unavoidable	17
Due to defective track and broken rails	14
Due to ice on track	1
Due to defective signals	2
Due to washouts	2
<i>Train Accidents Wherein Personal Injuries Resulted to Employees.</i>	
Unavoidable	3
Violation of rules	18
Unknown	6
Due to defective equipment	2
" faulty judgment	10
" defective track	6
" carelessness of electric line employees	1
" washouts	2
<i>Train Accidents which Resulted in Personal Injuries to Passengers.</i>	
Violation of rules	2
Unknown	1
Due to defective equipment	1
" faulty judgment	1
" washouts	1
Striking a mule, which resulted in derailment of train.....	1

Your committee, in going through the reports, find some

We find that quite a number of accidents occurred for the reasons that lateral clearances were not uniform, and we would recommend to the commission that they communicate with the American Railway Association with reference to establishing a uniform minimum clearance for various classes of structures, with a view of having the railways of the state of Indiana adopt the same and the railway commission assist in enforcing them.

All Stockholders Have Equal Right to Vote.

At Albany, N. Y., December 15, Supreme Court Justice Fitts held that under the statutes of New York state any stockholder of a corporation can demand the right to vote at corporate meetings regardless of the classification of his holdings as preferred or common stock, and that the corporation has no legal right to exclude him. The decision was given in the matter of the Royal Securities Company against Secretary of State Whalen. The Secretary of State had refused to file articles of incorporation of the concern on the ground that the proposed charter required that preferred stockholders should not have the right to vote. Attorneys representing the company brought a mandamus proceeding and Justice Fitts sustained the ruling of the Secretary of State.

Manhattan Bridge Examination.

Mayor McClellan, of New York, has announced that the Commissioner of Bridges will have an independent expert engineer examine the design and methods of construction of the Manhattan Bridge over the East river. The request for an investigation came from the transit committee of the City Club. The bridge is a suspension bridge, and the main cables are now being completed.

Investigation of the Pullman Company.

Commissioner Franklin K. Lane, of the Interstate Commerce Commission, began taking testimony at Chicago on December 14 in the proceeding of George F. Loftus, of St. Paul, Minn., against the Pullman Company. Mr. Loftus in his complaint makes a general allegation that the rates of the Pullman Company are excessive. William Hough, Second Assistant Auditor of the Pullman Company, who was a witness, said that the business of the company was precarious, as it was dependent for its continued existence on the railways. He admitted that it had contracts with the railways covering periods of 20 years, but said that most of these contracts have clauses allowing the railway to withdraw on six months' notice. One railway which had withdrawn from such a contract was the Chicago, Milwaukee & St. Paul. The company owns 4,750 cars that are used on the railways of the United States, Canada and Mexico. The number in actual service during the year ended June 30, 1908, was 3,904, of which 3,383 were standard sleeping cars and 521 tourist cars. On an average 300 new cars were put in service each year. The company had made an appropriation of \$3,000,000 to meet the loss on disused cars, which amounted to \$332,000 in 1908. It was estimated that the cars are worth approximately \$74,000,000. The cost of operation per car per annum was \$1,906, and the cost of repairs and maintenance was \$2,426. The sleeping car business, Mr. Hough said, is kept separate from the manufacturing business of the company, cars being bought from the manufacturing department for the manufacturing cost plus a profit of 10 per cent.

The Boll Weevil Special.

The passenger department of the Illinois Central has this week run a special train through the cotton districts of Mississippi for the purpose of giving lectures to the cotton growers on the protection of the cotton crop against the boll weevil and other dangers.

Smiles in Business.

At the Union Station in Portland, Oregon, which is operated by the Northern Pacific Terminal Co., some of the instructions to employees are posted in the public rooms where passengers may read them. The paragraph concerning courtesy says that employees must be polite and considerate in their intercourse with each other (as well as with the public). When transacting business with passengers or other patrons "do so with a smile and with pleasant words * * *."

Central Association of Railroad Officers, St. Louis Division.

At the meeting on December 11 the following officers were elected for the ensuing year: President, J. E. Taussig, Superintendent Terminals, Wabash; Vice-President, J. J. Coakley, Superintendent, Terminal Railroad Association of St. Louis; Secretary, J. Rothschild. Executive Committee, Charles Burlingame, Superintendent, Wiggins Ferry Company; John Fitzgerald, Superintendent Terminals, Louisville & Nashville; E. H. DeGroot, Jr., Superintendent, Chicago & Eastern Illinois. Interchange Committee: J. W. Dean, Superintendent Terminals, Missouri; Pacific; J. J. O'Brien, Supervisor Car Department, Terminal Railroad Association; J. E. Mechling, Master Mechanic, Vandalia; P. W. Conley, Superintendent Terminals, Frisco; C. M. Hoffman, Master Mechanic, Southern Railway.

Transportation Club of Indianapolis.

The Transportation Club of Indianapolis is being organized in that city by shippers, consignees and railway officers. The purpose of the club is to create a better understanding between shippers and receivers and the railways, and to bring about a closer personal acquaintance. It is not proposed to interfere with the work of the Indianapolis Freight Bureau.

American Society of Civil Engineers.

At the meeting held on Wednesday, December 16, a paper by William L. Sibert, M. Am. Soc. C. E., entitled, "The Improvement of the Ohio River," was presented for discussion.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

- AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; June, 1909.
- AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—R. W. Pope, 33 West 39th St., New York; second Friday in month; New York.
- AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 24 Park Pl., New York; May, 1909; New York.
- AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—S. F. Patterson, B. & M., Concord, N. H.; Oct. 19, 1909; Jacksonville, Fla.
- AMERICAN RAILWAY ENGINEERING AND MAINT. OF WAY ASSOC.—E. H. Fritch, Monadnock Bldg., Chicago; March 16-18, 1909; Chicago.
- AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 16-18, 1909; Atlantic City.
- AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and Aug.; New York.
- AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York; Jan. 12, 1909; New York.
- AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—B. V. Swenson, 29 W. 39th St., New York.
- ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 28, 1909; Cincinnati.
- ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. L. Young, C. & N.-W. Ry., Chicago, Ill.; May, 1909; Detroit, Mich.
- ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Wisconsin Central Ry., Chicago; June 23-25, 1909; Detroit.
- ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York.
- CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
- CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, Montreal, Que.; January; Montreal.
- CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
- FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Rich., Fred. & Pot. R.R., Richmond, Va.; June 16, 1909; Old Point Comfort, Va.
- INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 62 Liberty St., New York; May, 1909; Louisville, Ky.
- INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; June, 1909.
- IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Iowa; 2d Friday in month, except July and August; Des Moines.
- MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony Bldg., Chicago; June 21-23, 1909; Atlantic City.
- NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
- NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
- NORTH-WEST RAILWAY CLUB.—T. W. Flannagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, Aug.; St. Paul and Minn.
- RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, Pittsburgh, Pa.; 4th Friday in month, except June, July and August; Pittsburgh.
- RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; March 15, 1909; Chicago.
- ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Nov., 1909; Washington.
- ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
- SOUTHERN AND SOUTHWESTERN RY. CLUB.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs. Jan., April, Aug. and Nov.; Atlanta.
- TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R. R.R., East Buffalo, N. Y.; September, 1909; Denver.
- WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony Bldg., Chicago; 3d Tuesday each month, except June, July and August; Chicago.
- WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, Monadnock Bldg., Chicago; 1st Wednesday, except July and August; Chicago.

Traffic News.

Two ticket scalpers at San Antonio, Tex., were on December 9, fined \$100 each and sent to jail for three days by a state court for violating a permanent injunction issued by the court against ticket scalping.

The United States Circuit Court at San Francisco, Judge William Van Fleet, has temporarily enjoined Wells, Fargo & Co. from making the proposed increases in rates referred to December 11, page 1557.

The St. Louis & San Francisco has announced that it will make special rates next year for merchants coming from the Southeast to the St. Louis market. Heretofore such rates to St. Louis have been made only from the Southwest.

A committee representing the California Traffic Association has sent a protest against the advance of Pacific coast freight rates to E. H. Harriman, President of the Union Pacific and the Southern Pacific, and E. P. Ripley, President of the Atchison, Topeka & Santa Fe.

A shipment of 1,000 head of cattle for Europe has lately gone through Canada by way of Halifax, this in consequence of the prevalence of foot and mouth disease in several states, which has interfered with shipments by way of New York, Philadelphia and Baltimore.

The Illinois Manufacturers' Association, Chicago, has issued a circular bringing to the attention of its members the proposed advance in rates to the Pacific coast by the transcontinental railways and asking them how much the advance will cost their respective houses; and asking suggestions as to what steps should be taken by the association to get the roads to recede from their position.

The Nebraska State Railway Commission has authorized the South Omaha Stock Yards Company practically to double its switching charges. The new switching charges will vary from 75 cents to two dollars a car. Lest it be thought that the Nebraska Commission is recklessly cultivating a feeling of friendship toward the railways it should be added that the trunk line railways have to pay these switching charges.

At Washington last Monday shippers and bankers appeared before the congressional committee on interstate commerce in behalf of the proposition, which has been under consideration for a year or so, to regulate more in detail the issuance of bills of lading by common carriers. Complaint was made that station agents give bills of lading before goods are actually received, and that this and other loose practices are tolerated by the railway companies, and this results in frauds.

The executive committee of the Western Classification Committee and a committee of shippers conferred in Chicago on December 9 on a protest by the National Industrial Traffic League against the 10 per cent. increase in the rate required by the classification to be paid by shippers who refuse to ship freight subject to the uniform bill of lading. The National Industrial Traffic League contends that the railways should accept and transport shipments subject simply to their common law and statutory liability.

In the United States Circuit Court at Little Rock, Ark., December 11, Judge Trieber ruled, in a rebating case, that the payment of a rebate at one time and by one check constituted but one violation of the Interstate Commerce act, regardless of the number of shipments on which the payment was made. T. H. Bunch was indicted on 58 counts for receiving rebates on interstate shipments from the St. Louis, Iron Mountain & Southern. He pleaded guilty but contended that the government could not split one payment into 58 offenses; and he was sustained. Judge Trieber's ruling was in harmony with the finding of the United States Circuit Court of Appeals in the Standard Oil case.

The Interstate Commerce Commission has received transcontinental freight tariffs, to go into effect January 1, under which rates will be advanced on all eastbound traffic. The class rates on westbound traffic will remain as they are now. The commodity rates on westbound traffic from Atlantic seaboard points to Pacific coast terminals will be increased ap-

proximately 10 per cent. On eastbound class rates there will be a decrease (first class) from \$3.70 per 100 lbs. to \$3. On class rates to Chicago and Central Traffic Association territory from the Pacific coast there will be a decrease (first class) from \$3.40 to \$3. This will equalize the class rates east and west-bound. Eastbound commodity rates from the Pacific coast to Atlantic seaboard points will be advanced about 18 per cent. on the average, some of the items showing as high as 60 per cent. advance and some as low as 3 per cent.

The committee on railway transportation of the New York Board of Trade and Transportation has adopted a resolution—

That the New York Board of Trade and Transportation deprecates any action by business bodies, individual shippers, or Federal and State officials which may tend to aggravate public prejudice against railways, and urges the business men of the country to favor such freight rates as will insure the railways adequate revenues for maintaining the equipment and roadbed and handling the traffic.

Mr. Moore, the chairman of the committee, says: "We propose that the business men of New York make a concerted request to members of Congress and of the legislature to promote the return of prosperity by supporting moderation in the restriction of railways by concerted action they can do much to hasten the return of full employment and trade by promoting a restoration of railway activity and expenditure. We do not advocate a relaxation of government authority. Regulation has come to stay. We believe that it is as good for the railways as it is for the public. What we urge is that laws which compel increased expenditures by railways should be carefully scrutinized with reference to whether the railways possess the resources to meet them, and that freight rates should be considered in the same spirit as that in which shippers fix prices for their own goods."

INTERSTATE COMMERCE COMMISSION.

Through Express Rates to Foreign Ports.

Joseph Ullman v. Adams Express Co., et al. Opinion by Commissioner Prouty.

This is a petition for a rehearing. The testimony was originally taken by a single commissioner, and the complainant was then allowed 15 days to file his brief and the defendants were given an additional 10 days in which to file theirs. The time limit of the defendants expired on June 21, and the case was decided on June 25 before any brief was filed by the defendants. The defendants now claim that the commission denied them a full hearing. The complainant did not file his brief until June 13 and agreed that the defendants take additional time for the filing their briefs.

In regard to the time set for hearing, the commission is not in the same position as is a court, since complaints should be promptly heard and disposed of, and the commission with its other various duties cannot grant applications for extensions of time to accommodate parties and their counsel. Another reason for promptness is that the consequences of the commission's order to the complainant are usually insignificant in comparison with its consequences to the general public. The defendants later wrote the commission asking permission to argue their case orally, but this letter was not brought to the notice of the commission before the case was disposed of. The commission has never yet refused, and should only refuse under peculiar and unusual circumstances, the application of a party to be heard orally. Testimony is often taken in investigations without the presence of any member of the commission. The only opportunity which a party has of stating his views to this body by word of mouth is upon the argument. The importance of these arguments is recognized, and they will ordinarily be allowed as a matter of course.

The proceeding was reopened and set down for argument, but the former conclusion that \$3.50 per 100 lbs. is sufficient for the transportation of furs in bales and boxes from St. Paul, Minn., to New York was not changed. The commissioner is clearly of the opinion that if the defendants publish an export rate from St. Paul to New York which is less than a domestic rate, they must open this to the entire public and may not confine it to themselves or to a particular express company or forwarder, and that this export rate must be a fixed quantity and must be observed by the carriers, and can

only be changed on lawful notice. Whether the express companies may publish a through rate which they must observe to countries not adjacent is not decided.

Commissioner Harlan concurring.—The seaboard, which forms a natural terminus in the activity of the rail lines on the one hand and of ocean carriers on the other, has no special significance in the operation of an express line extending from domestic inland points to a foreign port. An express company that undertakes the transportation of express matter between domestic and foreign ports may do so under conditions that will exclude its competitors on the ocean from using its facilities on the land to their advantage and in competition with itself; thus I concur in the foregoing report, in so far as it makes no final disposition of the right of an express company to reserve for itself the exclusive benefit of its own facilities. I dissent from both this opinion and the one previously rendered in this case, in so far as either infers that express companies operating a through line to foreign ports may not lawfully fix their rates as the practical exigencies of the case may require. Chairman Knapp concurs in this view.

STATE COMMISSIONS.

The Oklahoma Corporation Commission has issued an order, effective December 21, reducing the rates of Wells, Fargo & Co. and the American and United States Express Companies. It is said that the new rates are on the basis of those heretofore charged by the Pacific Express Company in Oklahoma, and will make a reduction, for the companies affected, of 20 to 25 per cent.

The New York State Public Service Commission, First district (New York City), has ordered an increase in the number of trains to be run on the Sixth Avenue elevated road. The order requires:

Passing 50th street, southbound: 7:00 a. m. to 7:30 a. m., nine 7-car trains from Harlem; 7:30 a. m. to 8:00 a. m., eleven 7-car trains from Harlem, and three 6-car trains from Harlem; 8:00 a. m. to 8:30 a. m., eleven 7-car trains from Harlem; 8:30 a. m. to 9:00 a. m., ten 7-car trains from Harlem.

Passing 50th street, northbound: 4:30 p. m. to 5:00 p. m., nine 7-car trains to Harlem; 5:00 p. m. to 5:30 p. m., eleven 7-car trains to Harlem; 5:30 p. m. to 6:00 p. m., thirteen 7-car trains to Harlem; 6:00 p. m. to 6:30 p. m., fourteen 7-car trains to Harlem; 6:30 p. m. to 7:00 p. m., twelve 7-car trains to Harlem.

New York. Railroad Managers Not Presumed to be Wise.

Board of Trade of Danville v. Delaware, Lackawanna & Western. Opinion by Chairman Stevens.

The defendant in answer to a complaint to compel it to stop trains at Dansville says that its experience has led it to believe that to comply would be unprofitable. It may be that the experience of the men managing the railway of respondent has been as stated. If so, it is fairly incumbent upon them to go upon the stand and state the facts, not their conclusions, under oath. The respondent asks the commission to find without a particle of evidence that the action of the officers of the company was based upon good and businesslike reasons, without the officers of the company giving the slightest evidence to sustain that determination. The invalidity of such a position is apparent. If there is a conclusive presumption that the decisions of railway managers are correct, the functions of this commission are gone and its existence is unwarranted.

This commission cannot assume for an instant that a given thing should be done or ordered because the public or a considerable portion of the public asks for it without assigning reasons therefor, nor, on the other hand, that it should not be done because the railway managers have decided that they will not do it. The determination of this commission will be based upon its own judgment, enlightened in every possible way, but not upon the judgment of those it is created to supervise.

The trains are devoted to both state and interstate passenger service, and both are used to provide facilities for passenger traffic wholly within the state of New York. It may be that the respondent has not thought it necessary to

disclose to us the extent to which stopping those trains at Dansville would interfere with the interstate traffic. It has given us no light upon this point except incidental assertion, which is not evidence and cannot be treated as such. It may not be that it would prefer putting additional trains upon its road to supply the adequate and reasonable service to Dansville, which we find, as a fact, it does not now give, and we are quite willing to give it the option so to do. The commission therefore finds that the passenger train service is inadequate. It was shown that the cash passenger receipts for sale of tickets between Buffalo and Dansville amounted to approximately \$13,000 during the past year. This does not take into consideration the revenue derived from the sale of mileage books. The commission finds need for better passenger service from Dansville to Buffalo before the hour of 11 in the morning.

As to the evening service between Buffalo and Dansville the commission finds that there is a considerable demand for service from Buffalo later than 5.30 in the afternoon and earlier than 11.30 at night.

Nebraska. Increased Switching Charges at South Omaha.

In re application of Union Stock Yards Co. for permission to increase switching rates at South Omaha. Opinion by Commissioner Clarke.

The petitioner makes certain switching charges for handling cars at South Omaha of all the railways delivering or receiving cars of shippers and dealers whose plants are located on the petitioner's lines. An agreement dated April 27, 1896, recognizes the fact that switching at the Union Stock Yards shall be exclusively done by the Union Stock Yards Co. and fixes the charges for this switching. Testimony shows that on account of the increase in the cost of materials and labor, the petitioner while operating on a 59 per cent. basis in 1896 was in 1907 operating on a 96 per cent. basis. This clearly does not leave a sufficient margin of profit to pay reasonable fixed charges and depreciation. Moreover, the charges as fixed in the original agreement were on the basis of a per car charge, and since the average capacity of freight cars has very much increased since 1896, the petitioner is performing a greater service now for the same money than at the time the agreement was made. The petitioner is therefore permitted to increase its charges, and this increase shall be paid by the shippers and dealers where the charge is made for switching between plants on the lines of the petitioner, and the charge shall be absorbed by the railway companies delivering cars to the petitioner or receiving cars from it when the switching charge is made for shipments to all points not lying on the lines of the petitioner.

Increased Business in Hudson River Tunnel.

Traffic over the completed section of the Hudson & Manhattan Railroad Co.'s tunnels, from the Lackawanna station in Hoboken, to Sixth avenue and 23d street, Manhattan, has shown a monthly increase of approximately 150,000. The average daily travel in November was about 5,000 over the daily average in October, and that month showed the same relative increase over September. The company has not published any official figures, but it is estimated that at present the number of passengers traveling is at the rate of 20,000,000 a year. Officers of the company estimate that about 70 per cent. of the passenger traffic between the Lackawanna terminals and Manhattan is carried through the tunnels. This section has now been in operation for about nine months, and the result has exceeded expectations and has caused considerable optimism.

The lower tunnels between the Pennsylvania terminal at Montgomery street, Jersey City, and the Hudson terminal buildings at Church, Cortlandt and Fulton streets, Manhattan, will be completed and in operation by July 1 next, and will naturally have a heavier traffic than the existing tunnel, because of the better location of its eastern terminus. Officers of the Hudson Companies are quoted as saying that the recent sale of \$5,000,000 6 per cent. gold notes by that company will supply sufficient funds to cover the completion of the tunnels, and that no further financing will be required.—*Wall Street Journal.*

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF OCTOBER, 1908.

See also issue of December 11.

Name of road.	Mileage operated at end of period.	Operating revenues				Operating expenses				Net operating revenues (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decrease) comp. with last year.
		Freight.	Passenger.	Total.	Maintenance of structures, equipment.	Traffic.	Trans- portation.	General.	Total.					
Atlanta, Birmingham & Atlantic	642	\$135,620	\$44,250	\$179,870	\$20,290	\$10,670	\$61,241	\$5,461	\$133,363	\$75,156	.....	\$6,000	\$51,156	\$27,831
Baltimore & Annapolis	515	75,105	28,905	104,010	13,731	8,244	76,336	3,611	123,887	120,058	.....	1,500	118,558	49,738
Central of Georgia	1,916	795,195	228,096	1,023,291	133,205	27,293	76,336	33,609	108,153	425,052	.....	36,300	393,823	14,660
Central of New Jersey	668	1,478,789	349,654	1,828,443	193,771	25,361	510,557	30,609	1,096,073	1,096,073	.....	87,150	774,311	3,322
Chicago & Eastern Illinois	966	738,690	147,390	886,080	104,170	19,031	321,237	32,481	676,243	259,813	1,888*	21,500	230,425	\$7,703
Chicago, Indianapolis & Louisville	616	336,511	118,140	454,651	70,193	13,002	154,680	12,115	323,719	171,544	.....	3,000	150,444	\$7,002
Chicago, Lake Shore & Eastern	580	342,438	115,752	458,190	70,193	13,002	154,680	12,115	323,719	171,544	.....	3,000	150,444	\$7,002
Cincinnati, Hamilton & Dayton	1,036	515,982	145,722	661,704	86,401	14,186	288,929	19,329	553,841	146,782	.....	25,000	157,084	\$42,801
Cleveland, Chicago & St. Louis	1,982	1,577,783	558,980	2,136,763	243,287	71,432	919,661	40,744	1,739,676	1,739,676	.....	69,990	563,840	\$148,694
Colorado & Southern	1,250	657,807	192,718	850,525	103,918	14,136	251,097	32,768	533,035	267,654	.....	21,225	245,560	\$75,711
Delaware & Hudson	845	1,466,074	255,074	1,721,148	132,847	17,024	563,216	35,485	932,946	792,831	140*	35,000	1,440,212	\$108,267
Delaware, Lackawanna & Western	893	2,351,507	596,920	2,948,427	327,537	55,361	825,624	59,059	1,642,372	1,482,391	40,621	82,800	1,440,212	\$108,267
El Paso & Southwestern	867	485,580	129,325	614,905	65,179	80,924	167,148	8,659	342,121	247,519	.....	11,886	236,335	\$52,806
Florida East Coast	584	95,294	51,488	146,782	17,608	4,248	67,608	2,517	133,651	133,651	.....	11,000	8,028	\$30,553
Galveston, Harrisburg & San Antonio	1,341	764,804	180,019	944,823	132,082	119,590	370,517	25,015	668,560	316,815	.....	18,855	293,899	\$8,282
Grand Rapids & Indiana	590	251,333	124,782	376,115	43,598	59,998	145,286	13,606	274,993	133,615	.....	21,832	111,722	\$14,891
Houston & Texas Central	789	499,533	142,651	642,184	80,474	16,005	292,865	21,017	412,255	257,768	.....	9,010	248,758	\$96,433
Iowa Central	558	203,933	43,763	247,696	28,976	8,233	114,004	8,990	206,682	51,900	.....	553	7,488	\$30,155
Kansas City Southern	827	615,858	110,310	726,168	58,205	20,719	243,467	25,630	461,204	93,976	.....	17,000	298,454	\$35,250
Lake Erie & Western	724	312,949	62,937	375,886	51,947	84,565	110,843	53,696	232,867	1,462,651	.....	17,000	76,976	\$34,349
Lake Shore & Michigan Southern	1,508	2,563,257	771,410	3,334,667	333,831	8,827	255,413	21,318	533,432	324,026	.....	30,075	194,606	\$44,744
Maine Central	931	467,781	239,905	707,686	141,444	106,430	277,550	55,855	838,015	845,592	1,819	97,000	750,411	\$224,282
Minneapolis & St. Louis	1,746	1,621,102	553,075	2,174,177	126,064	10,130	364,368	22,530	559,234	347,659	.....	16,100	323,443	\$3,509
Minneapolis, St. P. & Sault Ste. Marie	2,308	1,145,597	280,179	1,425,776	97,101	125,424	267,128	12,118	509,767	814,197	.....	28,000	2,496,101	\$64,221
Mobile & Ohio	926	687,741	101,842	789,583	88,646	158,713	281,461	146,914	524,285	261,197	.....	366,107	2,496,101	\$64,221
N. Y. Central & Hudson River	3,588	4,961,836	2,134,941	7,096,777	859,994	43,104	3,068,089	12,118	5,207,767	3,811,197	.....	28,000	1,396,570	\$3,859
New York, Chicago & St. Louis	554	685,733	98,642	784,375	90,740	12,246	249,947	13,495	497,315	189,671	.....	15,416	169,193	\$18,392
New York, Ontario & Western	546	849,938	317,473	1,167,411	115,189	33,887	319,388	28,529	497,315	682,446	.....	42,173	616,233	\$140,645
Oregon R. R. & Navigation Co.	1,264	1,236,800	357,021	1,593,821	118,130	134,736	311,935	30,030	611,861	1,065,963	.....	49,759	1,016,576	\$236,189
Oregon Short Line	1,714	696,925	597,592	1,294,517	189,910	252,209	570,686	26,686	570,686	376,073	.....	31,142	344,931	\$188,962
Philadelphia, Baltimore & Washington	773	486,925	100,442	587,367	611,829	20,920	141,028	27,547	353,022	258,807	.....	15,025	242,689	\$36,227
St. Louis Southwestern	697	288,323	88,160	376,483	82,040	65,818	158,811	12,104	332,240	67,254	.....	303*	57,789	\$32,605
St. Louis Southwestern of Texas	829	562,847	191,081	753,928	125,017	129,417	301,778	15,992	594,040	247,071	.....	25,282	221,789	\$88,985
Vandalia	2,515	1,604,549	575,156	2,179,705	276,236	312,338	866,093	79,775	1,597,066	765,995	.....	72,673	691,632	\$145,298
Wabash	642	\$430,326	\$228,943	\$659,269	\$71,032	\$31,276	\$211,144	\$21,108	\$438,032	\$187,730	.....	\$24,000	\$163,730	\$52,282
Atlanta, Birmingham & Atlantic	642	675,529	228,943	904,472	160,025	81,450	277,362	14,617	616,609	336,499	.....	6,000	330,499	\$66,470
Baltimore & Annapolis	515	249,584	102,142	351,726	80,882	11,450	123,929	146,617	286,238	1,205,144	.....	1,000	1,006,032	\$1,605
Central of Georgia	1,916	1,604,790	460,790	2,065,580	213,898	104,984	1,939,029	144,088	1,883,368	3,046,247	.....	349,866	3,016,761	\$512,624
Central of New Jersey	668	2,650,444	613,478	3,263,922	416,072	19,031	1,170,195	138,312	1,280,882	1,030,175	.....	110,000	914,607	\$139,965
Chicago & Eastern Illinois	966	1,296,556	512,019	1,808,575	329,108	27,078	578,214	32,725	1,280,882	640,361	.....	86,000	554,361	\$138,917
Chicago, Indianapolis & Louisville	616	1,296,556	512,019	1,808,575	329,108	27,078	578,214	32,725	1,280,882	640,361	.....	86,000	554,361	\$138,917
Chicago, Lake Shore & Eastern	580	1,296,556	512,019	1,808,575	329,108	27,078	578,214	32,725	1,280,882	640,361	.....	86,000	554,361	\$138,917
Cincinnati, Hamilton & Dayton	1,036	1,296,556	512,019	1,808,575	329,108	27,078	578,214	32,725	1,280,882	640,361	.....	86,000	554,361	\$138,917
Cleveland, Chicago & St. Louis	1,982	2,116,484	657,125	2,773,609	292,872	50,995	1,067,970	106,177	1,224,044	1,001,833	.....	140,000	2,686,664	\$682,176
Colorado & Southern	1,250	2,116,484	657,125	2,773,609	292,872	50,995	1,067,970	106,177	1,224,044	1,001,833	.....	140,000	2,686,664	\$682,176
Delaware & Hudson	845	4,907,367	1,254,992	6,162,359	641,403	80,995	2,100,703	185,577	2,286,280	2,824,698	.....	421,200	4,701,070	\$119,604
Delaware, Lackawanna & Western	893	8,153,657	2,545,633	10,699,290	1,383,805	144,195	3,579,070	31,884	3,610,954	862,773	.....	44,746	818,027	\$11,063
El Paso & Southwestern	867	1,741,758	300,063	2,041,821	195,712	609,316	1,171,131	106,177	2,255,038	1,124,302	.....	97,645	1,018,137	\$308,834
Florida East Coast	584	317,846	195,712	513,558	60,936	15,917	315,478	31,884	721,493	112,177*	.....	44,746	156,177*	\$11,063
Galveston, Harrisburg & San Antonio	1,341	2,580,018	690,735	3,270,753	349,340	33,842	1,171,131	106,177	2,255,038	1,124,302	.....	97,645	1,018,137	\$308,834
Grand Rapids & Indiana	590	863,380	519,378	1,382,758	1,663,231	214,013	766,102	77,851	1,067,281	595,957	.....	49,170	661,417	\$108,000
Houston & Texas Central	789	1,530,356	456,705	1,987,061	217,273	275,092	1,067,970	106,177	2,255,038	1,124,302	.....	49,170	661,417	\$108,000
Iowa Central	558	787,506	162,114	949,620	1,038,273	105,915	417,197	102,133	1,786,752	293,595	.....	29,674	263,921	\$189,265
Kansas City Southern	827	2,208,089	366,960	2,575,049	1,561,019	343,462	84,979	40,950	1,786,752	293,595	.....	29,674	263,921	\$189,265
Lake Erie & Western	724	1,149,089	220,806	1,369,895	1,561,019	343,462	84,979	40,950	1,786,752	293,595	.....	29,674	263,921	\$189,265
Lake Shore & Michigan Southern	1,508	8,950,634	3,660,936	12,611,570	1,561,019	343,462	84,979	40,950	1,786,752	293,595	.....	29,674	263,921	\$189,265
Maine Central	931	1,616,967	1,258,430	2,875,397	3,068,672	277,872	1,067,970	106,177	2,255,038	1,124,302	.....	49,170	661,417	\$108,000
Michigan Central	1,746	5,502,957	2,457,137	7,960,094	1,166,919	119,151	3,579,070	31,884	3,610,954	862,773	.....	44,746	818,027	\$11,063
Minneapolis & St. Louis	2,308	3,378,224	1,164,908	4,543,132	487,058	470,471	1,067,970	106,177	2,255,038	1,124,302	.....	49,170	661,417	\$108,000
Minneapolis, St. P. & Sault Ste. Marie	2,515	16,867,916	10,699,290	27,567,206	3,068,672	277,872	1,067,970	106,177	2,255,038	1,124,302	.....	49,170	661,417	\$108,000
Mobile & Ohio	926	2,284,889	425,904	2,710,793	3,155,327	478,568	1,067,970	106,177	2,255,038	1,124,302	.....	49,170	661,417	\$108,000
N. Y. Central & Hudson River	3,588	2,393,520	690,735	3,084,255	3,068,672	277,872	1,067,970	106,177	2,255,038	1,124,302	.....	49,170	661,417	\$108,000
New York, Chicago & St. Louis	554	3,158,934	793,498	3,952,432	3,068,672	277,872	1,067,970	106,177	2,255,038	1,124,302	.....	49,170	661,417	\$108,000
New York, Ontario & Western	546	3,352,998	1,302,179	4,655,177	3,068,672	277,872	1,067,970	106,177	2,255,038	1,124,302	.....	49,170	661,417	\$108,000
Oregon R. R. & Navigation Co.	1,264	4,233,742	1,491,925	5,725,667	3,068,672	277,872	1,067,970	106,177	2,255,038	1,124,302	.....	49,170	661,417	\$108,000
Oregon Short Line	1,714	2,753,541	2,341,923	5,095,464	3,068,672	277,872	1,067,970	106,177	2,255,038	1,124,302	.....	49,170	661,417	\$108,000

The Association Ticket Paper.

At the recent annual convention of the American Association of General Passenger and Ticket Agents in Toronto, the Standing Committee on Association Ticket Paper made several recommendations as to details which were unanimously adopted by the Association. It was recommended that the paper hereafter be manufactured with the Association trade-mark on the back of the ticket only instead of on the face, and that the face should present only an oval design containing the words "Association Ticket Paper," with a small star at each end and with wavy lines on both back and face as formerly, and that no other mark, whether a printing company's initials or designating letter or otherwise, be placed on the paper. This recommendation was made for the reason that the broad lines of the trade-mark on the face of the ticket in some cases prevent the printers' ink from showing plainly, and detract from the neat and clear appearance of the ticket. The committee also recommends that the drab shade of the new Association paper be adopted for round-trip tickets instead of the pink shade as originally recommended, it having been shown by experience that the latter tint is liable to fade more quickly than any other color. The round-trip tickets of drab tint previously used were those which suffered chiefly from alterations, but it is the opinion of the committee that the construction of the new Association ticket paper, consisting of a white body with a distinctive surface color with a pronounced design and thin and absorbent texture protects the ticket against alteration to a degree not possible with the solid tint of the old paper. In connection with the subject of safety paper the secretary made an extended report in regard to the control of the Association over the use of its trade-mark and the refusal or neglect of certain printing houses to give the required bond. It was voted by the Association that bonds of licensed printers must be kept alive at all times, and that if any printer at any time refuses to renew his bond his license shall be immediately canceled. The new Association ticket paper, now being manufactured by George La Monte & Son, is giving general satisfaction, and its use is rapidly extending.—*Official Guide.*

New Lake Steamers.

The Mutual Transit Company, Buffalo, N. Y., has just ordered from the Great Lakes Engineering Co., Detroit, Mich., two new steel steamers to be delivered at the opening of navigation in the spring of 1909. These vessels will measure 350 ft. long, 46 ft. beam and have a capacity of 5,000 tons each. Including these the Mutual Transit Company will have twelve steamers operating between Buffalo, N. Y.; Cleveland, Ohio; Duluth, Minn.; Gladstone, Mich.; Green Bay, Wis., and Portage Lake ports, in connection with the railroad lines east and west of these ports. The company began business in 1903 with only six steamers purchased from the Great Northern. It was soon found necessary to charter two additional vessels. In 1907 the company purchased the four steamers of the Soo Line, then operating between Buffalo, N. Y., and Gladstone, Mich., in connection with the Minneapolis, St. Paul & Sault Ste. Marie beyond.

Passenger Rates in South Dakota.

Testimony was taken in Chicago last week before a master in chancery in the proceeding of the railways of South Dakota permanently to enjoin the State Railroad Commission from enforcing the 2½-cent fare law. The most important witness was A. J. Earling, President of the Chicago, Milwaukee & St. Paul. Answering questions about the value of the St. Paul in South Dakota, Mr. Earling said that the original cost of a road does not fix its value. The development of a railway property costs more than the original construction. The Dakota lines of the St. Paul cost about \$25,000 a mile to build, but this was far from representing their value. In reply to a question by Attorney-General Dougherty, of Dakota, Mr. Earling said that he did not know exactly what the lines in South Dakota cost, although he might make an accurate estimate as to what it would cost to replace them. Twenty-five miles of the line of the Pacific coast extension in South Dakota cost \$46,000 per mile and trains are now running over

it, but Mr. Earling said it was not completed. He said it could be proved that local traffic was much more expensive than interstate traffic. The railways introduced testimony to show that all the lines in South Dakota are running at a loss and have accumulated deficits in the last 15 years of \$3,000,000.

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

A. Patriarche, General Traffic Manager of the Pere Marquette, has been appointed Assistant to the President.

Judge John F. McClure has been appointed a member of the Indiana Railroad Commission, succeeding Union B. Hunt, resigned.

B. L. Birkholz, Eastern Agent of the El Paso & Southwestern system, has been appointed Assistant to the Secretary, with office at New York. His former office has been abolished.

Jas. F. Fahnestock, Treasurer of the International Mercantile Marine, has been appointed to the new office of the Assistant Treasurer of the Pennsylvania, with office in New York.

Lewis Rhoton and E. B. Kinsworthy have been appointed General Attorneys of the St. Louis, Iron Mountain & Southern for the state of Arkansas, succeeding T. E. Mehaffey, resigned, effective January 1.

J. L. Willcutt, Secretary of the California Northeastern and the North-Western Pacific, will retire about January 1. He has been actively in service on the Southern Pacific System since 1865. He was born July 9, 1829.

Operating Officers.

W. H. Stillwell, Assistant Trainmaster of the Chicago Great-Western at St. Joseph, Mo., has been appointed Trainmaster of the St. Paul & Des Moines, with office at Iowa Falls, Iowa.

D. C. Coleman has been appointed Superintendent of Car Service of the Canadian Pacific, succeeding J. A. MacGregor, who was Assistant Superintendent, assigned to other duties.

W. C. Welch, Trainmaster of the Chicago, Burlington & Quincy at Creston, Iowa, has been appointed Assistant Superintendent of the Brookfield division, with office at Brookfield, Mo.

S. E. Burkhead, Inspector of Transportation of the International & Great Northern, has been appointed Assistant Superintendent of the Gulf division, his former office having been abolished.

H. W. Sheridan, Assistant Superintendent of the Sacramento division of the Southern Pacific, has been appointed Superintendent of that division, succeeding Dennis Burkhalter, deceased.

W. S. Kirby, Superintendent of the Chicago, Burlington & Quincy at Ottumwa, Iowa, has been appointed Superintendent at Aurora, Ill., succeeding J. Russell, resigned. W. F. Thiehoff, Superintendent at Brookfield, Mo., succeeds Mr. Kirby.

D. C. Coleman has been appointed Superintendent of Car Service of the Canadian Pacific, Western Lines, succeeding to the duties of J. A. MacGregor, Assistant Superintendent, whose appointment as Superintendent of the Fourth district we have announced.

O. L. Dickeson, Assistant Superintendent of Transportation of the Chicago, Burlington & Quincy at Omaha, Neb., has been appointed Special Inspector of Transportation, with office at Chicago, reporting to the Second Vice-President. G. W. Covert succeeds Mr. Dickeson.

C. S. Maharg, Superintendent of the Canadian Pacific at Saskatoon, Sask., has been transferred as Superintendent to Medicine Hat, Alb., succeeding J. S. Lawrence, assigned to other duties. T. R. Flett, Superintendent at Brandon, Man., succeeds Mr. Maharg, and W. J. Uren, Chief Dispatcher at Winnipeg, Man., succeeds Mr. Flett.

L. B. Lyman, Superintendent of the Sterling division of the Chicago, Burlington & Quincy, at Sterling, Neb., has been appointed Superintendent of the Wymore division, with office at Wymore, Neb., succeeding C. B. Rodgers, resigned to take employment with another road. W. M. Weidenhamer, Trainmaster at McCook, Neb., succeeds Mr. Lyman.

D. T. Crawford, Trainmaster of the Union Pacific at Kansas City, Mo., has been appointed Trainmaster of the Missouri Pacific, at Cornell, Kan. He will have jurisdiction over the Pittsburgh district and the Fort Scott and Asbury branches. The jurisdiction of D. H. Robinson, Trainmaster at Nevada, Mo., will extend over the Pleasant Hill district, Madison, Rich Hill and Granby branches.

L. Warrington Baldwin, whose appointment as Superintendent of the Yazoo & Mississippi Valley has been announced in these columns, was born at Waterbury, Md., September 26, 1875. He graduated from Lehigh University in 1896 with the degree of C.E. In July, 1896, he began railway work as a chainman on the Illinois Central. In September, 1897, he became a rodman and in March, 1898, he was made Assistant Engineer of the Memphis division, at Memphis, Tenn. In September of the same year he was appointed Assistant Engineer of the Ft. Dodge-Omaha, line, which was under construction. In January, 1900, he was made Supervisor of the Illinois Central from Springfield to St. Louis. In September, 1901, he became Roadmaster of the Yazoo & Mississippi Valley, at Memphis, and in April, 1902, was made Roadmaster of the Illinois Central at Water Valley, Miss. In August, 1904, he was transferred as Roadmaster to New Orleans, La., and in November, 1904, was appointed Trainmaster at Water Valley. In December, 1905, he was made Trainmaster of the Indianapolis Southern, with office at Indianapolis, Ind., and in April, 1906, he was appointed Superintendent of the same road at Indianapolis. From March, 1908, to his recent appointment he was Trainmaster of the Indianapolis Southern and the Peoria division of the Illinois Central, with office at Mattoon, Ill.

Traffic Officers.

F. M. Wilkinson, General Freight and Ticket Agent of the Cincinnati & Muskingum Valley, will retire on January 1.

J. S. Houston has been appointed General Agent, Freight Department, of the International & Great Northern at St. Louis.

W. H. Comer has been appointed General Agent of the Chicago Great Western, at Denver, Colo., succeeding W. S. Hillis, resigned to engage in other business.

C. P. Coleman has been appointed Traveling Freight Agent of the Atchison, Topeka & Santa Fe, with office at Buffalo, N. Y., succeeding C. W. Cook, Jr., resigned.

Thomas R. Wilt, Local Passenger Agent of the Pennsylvania at Chicago, has been appointed City Passenger Agent, succeeding Frank Bamford, resigned. F. O. Birney will succeed Mr. Wilt.

B. M. Haile has been appointed Traffic Manager of the Oklahoma Central, with office at Purcell, Okla., succeeding Joseph P. O'Donnell, resigned. The office of General Freight and Passenger Agent has been abolished.

J. N. Tittmore, Freight Traffic Manager of the Minneapolis & St. Louis and the Iowa Central, has been appointed General Traffic Manager of the Pere Marquette, succeeding A. Patriarche, promoted to Assistant to the President.

Ralph L. Roe has been appointed to a position in the office of the Traffic Manager of the Marcellus & Otisco Lake at Marcellus, N. Y. We erroneously stated in our issue of last week that Mr. Roe had been appointed Auditor of this company.

W. F. Meath, Contracting Freight Agent of the Illinois Central and Yazoo & Mississippi Valley, at Memphis, Tenn., has been appointed Commercial Agent at Memphis, succeeding J. H. Mallory, promoted. W. L. Wallace succeeds Mr. Meath.

Geo. McL. Brown, General Passenger Agent of the Canadian Pacific, Atlantic Steamship Lines, has been appointed General European Traffic Agent at London, Eng., succeeding Allan Cameron, who has been appointed Assistant Traffic Manager

at New York. W. G. Annable, General Baggage Agent of the Canadian Pacific at Montreal, Que., has been appointed General Passenger Agent of the Canadian Pacific Atlantic Steamship Lines, with office at Montreal, succeeding Mr. Brown.

Engineering and Rolling Stock Officers.

The office of B. F. Rodgers, Supervisor of Road of the Baltimore & Ohio at Philadelphia, Pa., was moved, on December 1, to Darby, Pa.

A. West has been appointed Master Mechanic of District 1 of the Canadian Pacific, with office at Kenora, Ont., succeeding A. H. Eager.

Calvin Schreck has been appointed Head Foreman of Engines of the Cleveland, Cincinnati, Chicago & St. Louis at Bellefontaine, Ohio.

Fred Regan has been appointed Master Mechanic of the Southern division of the Kansas City Southern, with headquarters at Shreveport, La.

W. L. Hudson has been appointed Road Foreman of Engines of the Pittsburgh division of the Pennsylvania, succeeding J. K. Russell, retired, with headquarters at Pittsburgh.

A. W. Horsey has been appointed Master Mechanic of the Chalk River section of District 4 of the Canadian Pacific, with headquarters at Smith's Falls, Ont., succeeding G. T. Fulton.

E. J. Shoffner, Foreman of the Frog and Rail Mill of the Norfolk & Western at the Roanoke shops, has been appointed General Foreman at Cleveland Ohio, succeeding H. F. Staley, whose appointment as Master Mechanic of the Carolina, Clinchfield & Ohio we have previously announced.

C. M. Ingersoll, Chief Engineer of the Bridge department of New York City, has resigned to become Consulting Engineer for the department. K. L. Martin succeeds Mr. Ingersoll. Mr. Ingersoll was born in 1858 at New Haven, Conn., and graduated from the Sheffield Scientific School of Yale University in 1880. He began railway work in 1881 in the office of the Superintendent of Motive Power of the Missouri Pacific. In 1882 he was made Division Engineer of the New York, New Haven & Hartford. In 1892 he became City Engineer of New Haven, and a year later was made Assistant Engineer in charge of construction on the New York, New Haven & Hartford. In January, 1897, he was appointed assistant to the President of the New Haven, and in May, 1900, was made Chief Engineer. In 1905 he became Commissioner of Real Estate, Right of Way and Taxes of the company, and the next year resigned to become Chief Engineer of the Department of Bridges of New York City. Mr. Martin, who succeeds Mr. Ingersoll, was born in Brooklyn, N. Y., in 1869, and is a graduate of the Brooklyn Polytechnic Institute and of the Stevens Institute of Technology, where he took the degree of Mechanical Engineer. After serving on the engineer corps of the East River Bridge Co. he was appointed Assistant Engineer on the Brooklyn Bridge. He is a member of the American Society of Mechanical Engineers and of the Brooklyn Engineers' Club.

OBITUARY.

Elmer H. Spalding, Supervisor of Signals of the Terminal division of the Boston & Maine at Boston, and one of the best known and most popular members of the Railway Signal Association, was killed November 6 by being run over by a car in the yard near Boston. He was hurrying across tracks to assist a repairman. Mr. Spalding was born in East Boston in 1861. He worked for the Union Electric Signal Co., of Boston, one of the predecessors of the Union Switch & Signal Co., and thus was one of the pioneers in signal work in America. He had been with the Boston & Maine for 20 years or more.

George W. Butcher, formerly Superintendent of Motive Power and Machinery of the San Antonio & Aransas Pass, whose death was announced in our columns last week, was born at Greensborough, S. C., in 1842. He began railway work in 1856 in the machine shop at Harrisburg, Tex., of the Buffalo Bayou, Brazos & Colorado, now a part of the Galveston, Harrisburg & San Antonio. He was later appointed Roundhouse Foreman at Lafayette, La. Three years later he was appointed General Foreman of the Sabine & East

Texas, now a part of the Texas & New Orleans. In 1888 he was made General Foreman of the Galveston, Harrisburg & San Antonio at Houston, Tex. In 1893, he was appointed Superintendent of Motor Power and Machinery of the San Antonio & Aransas Pass, which position he held until his resignation on August 15 last. He was the patentee of an air-brake coupler now in general use on the San Antonio & Aransas Pass, and of a device for oil-burning locomotives.

Richard H. Soule, for 30 years active in railway work, died at his home, Brookline, Mass., December 13. He was born in 1849 at Boston, Mass., and began railway work in 1875 as draftsman in the Mechanical Engineer's office of the Pennsylvania at Altoona, Pa. Two years later he became assistant in the test department. In 1879 he was made Superintendent of Motive Power of the Northern Central. In 1881 he became Superintendent of Motive Power of the Philadelphia & Erie division of the Pennsylvania, and a year later was made Superintendent of Motive Power of the Pittsburgh, Cincinnati & St. Louis, now part of the Pennsylvania Lines West. In 1885 he was made Superintendent of Motive Power of the New York, West Shore & Buffalo, now part of the New York Central & Hudson River, and later in the same year became Superintendent of Motive Power of the New York, Lake Erie & Western, now the Erie, and two years later was made General Manager. In 1888, leaving railway work, he became General Agent for the Union Switch & Signal Co., but returned to the railways in 1891 as Superintendent of Motive Power of the Norfolk & Western. From 1897 to 1899 he was with the Baldwin Locomotive Works, traveling for one year in South Africa and Russia, and for a year and a half was Western representative at Chicago. In 1900 he opened offices in New York as Consulting Engineer, retiring in 1905. Mr. Soule's writings are well known to readers of the *Railroad Age Gazette*.

Railroad Construction.

New Incorporations, Surveys, Etc.

ALBERTA CENTRAL.—Application will be made by this company for powers to extend its proposed line from the westerly terminus near Rocky Mountain House, Alb., to the Grand Trunk Pacific, in or near the Yellowstone Pass; also its present terminus near the elbow of Battle river to Saskatoon, Sask., or Warman, and also from east of Red Deer, Alb., southerly and easterly to Moose Jaw. Smith & Johnston, Ottawa, Ont., are solicitors for the company. (See Canadian Pacific, October 30, p. 1274.)

ATLANTIC, QUEBEC & WESTERN.—An officer writes that this company has 62 miles of line under construction in Quebec between Pabos and Gaspé by the New Canadian Co., Ltd., New Carlisle, Que., Canada.

AUGUSTA SOUTHERN.—President A. B. Andrews is quoted as having said that revision of grades and curves will be started in the near future.

BALTIMORE & OHIO.—Isham Randolph, a consulting engineer of Chicago, has been preparing plans for the Grade Crossing Commission of Baltimore, Md., in conjunction with Baltimore & Ohio engineers for the elimination of grade crossings in Baltimore. Press reports indicate that plans have been submitted to the city requiring a change of the line for more than a mile and the building of overhead highway crossings.

BEAUMONT & SARATOGA TRANSPORTATION.—An officer writes that an extension is projected from Mile Post 9 to Saratoga, Tex., about 13 miles.

BEAVER VALLEY & NORTHWESTERN.—T. E. Luttgerding, Wichita, Kan., is said to have received a contract for building this line from Gage, Ellis county, Okla. via Beaver, to Hooker, about 100 miles. (Nov. 13, p. 1573.)

CALIFORNIA NORTHEASTERN.—See Southern Pacific.

CANADIAN NORTHERN.—Vice-President D. D. Mann is quoted as saying that the Morinville branch is to be extended north to Athabaska Landing, Alb., 75 miles, provided the govern-

ment carries out the agreement to guarantee the bonds. Construction work, it is expected, will be started early in the spring. (*Railroad Gazette*, March 13, p. 395.)

CANADIAN NORTHERN QUEBEC.—Subsidy contracts, at \$3,200 a mile, have been entered into with the Canadian government for the construction of railway lines; one from near Arundel, Que., to a point near the united townships of Preston, Que., and Hartwell about 30 miles, and another to connect its Montfort and Gatineau line with the main line, about 15 miles.

CANADIAN ROADS.—Reports made to the Department of Railways and Canals, Ottawa, say that surveys for the government line north to Hudson Bay are progressing rapidly. It is expected the final report will be made by the end of February, 1909. About 100 surveyors are now at work on several alternative routes. (Aug. 21, p. 787.)

CANANEA, YAQUI RIVER & PACIFIC.—See Southern Pacific.

CENTRAL CALIFORNIA.—See Southern Pacific.

DEKALB, MIDLAND (ELECTRIC).—Incorporated in Illinois with \$150,000 capital to build a line from DeKalb, Ill., south to Sandwich, 20 miles. J. W. McQueen, H. J. Burdick and W. G. Wilcox, of Elgin; O. F. Cole and J. F. Pearce, of Chicago, are incorporators.

DELAWARE & HUDSON.—An officer of the Quebec, Montreal & Southern writes that this company has located an extension from St. Philomene, Que., east to Quebec bridge, 41 miles; and to Levis, an additional seven miles; also for a branch from Beaucourt to St. Lawrence river, four miles.

ERIE.—An officer writes that work is now under way on the Genesee River Railroad, building from Hunts, N. Y., to Cuba, 33.25 miles.

The Penhorn Creek Railroad is to have a total length of 4.74 miles, and includes a four track open cut through Bergen Hill, Jersey City. Track has been laid on 0.76 miles which is now in service on the Hackensack meadows. (Nov. 20, p. 1418.)

FLORIDA EAST COAST.—Newspapers report that officers of this company say that the entire line from Miami, Fla., south to Key West, 184 miles, will be in operation within a year. The road is now in operation from Miami south to Knight's Key, 112 miles, and more than 40 miles have been built from Key West north, making a total of 152 miles finished. The work yet to be done includes the construction of a roadbed on concrete in the open ocean from Knight's Key south to Bahia Honda, 11 miles. (Aug. 28, p. 788.)

GENESEE RIVER RAILROAD.—See Erie.

GREAT NORTHERN.—An officer writes that work is now under way by the Utah Construction Co., of Ogden, Utah, and Maney 16.35 miles; also from the Columbia river in the state of Washington northwest for 50 miles, and on the Vancouver, Victoria & Eastern, from Keremeos, B. C., northwest to Princeton, 41 miles. (Oct. 2, p. 1075; Nov. 13, p. 1374.)

GREENVILLE & KNOXVILLE.—An officer writes that an extension is projected from Cleveland, S. C., north to River Falls, five miles.

HOUSTON & BRAZOS VALLEY.—An officer writes that contract has been given to I. T. Austin, of Velasco, Tex., for an extension from Velasco to Quitman, three miles. (June 19, p. 209.)

INTER-CALIFORNIA.—See Southern Pacific.

INTERNATIONAL RAILWAY OF NEW BRUNSWICK.—A subsidy contract has been entered into with the Canadian government, superseding the contract previously made for the construction of a railway line starting from the western end of the 20 miles already built from Campbellton, N. B., and running to a point on the St. John river, between Grand Falls and Edmundston. In the new agreement, the subsidy rate is raised from \$3,200 a mile to \$6,400 a mile. (June 26, p. 409.)

KANSAS CITY, MEXICO & ORIENT.—An officer writes that work is now under way on this road from Sweetwater, Tex., south to San Angelo, to complete a section of 63 miles; and in Mexico, east from Rio Conchas, west from Sanchez and east

from Hornillos. The International Construction Co., of Kansas City, are the contractors. (Nov. 13, p. 1374.)

KETTLE VALLEY.—A subsidy contract, at \$3,200 a mile, has been entered into with the Canadian government for the construction of a railway line from Carmi, B. C., to Penticton, about 50 miles.

LONG ISLAND.—An officer writes regarding the pending negotiations between the Board of Estimate and the Long Island Railroad in reference to the abolition of grade crossings, that tentative plans have been agreed upon, which are later to be covered by a formal agreement, to be executed by the city and the railway company. The plans are to outline as definitely as possible the rights of both parties and the division of the expense for the abolition of existing and the prevention of future grade crossings. The various sections of the railway affected by the agreement in the Borough of Queens are on the Main line, Montauk division, North Side division, Manhattan Beach division, and the Glendale cut-off. The completion of the work as planned will do away with about 70 existing grade crossings, and will allow the opening of new streets from time to time, as required, without any revision in the ultimate railway grades.

LOUISVILLE & NASHVILLE.—An officer writes that contract has been given to Wilson, McDowell & Borches, of Knoxville, Tenn., for an extension from Madisonville, Ky., to Mitchell, 55 miles.

MARITIME COAL, RAILWAY & POWER COMPANY.—A subsidy contract for \$3,200 has been entered into with the Canadian government for the construction of a railway line from Joggins Mines, N. S., to a point on the Bay of Fundy, about one mile.

METO VALLEY.—An officer writes that this company, which was recently incorporated, has made plans to build a line from McCreanor, Ark., south about 16 miles. The work will include one bridge. Contracts for building the line are to be let by January 15, 1909. (November 20, p. 1419.)

MILWAUKEE WESTERN ELECTRIC.—This company intends to build an interurban line from Milwaukee, Wis., to Beaverdam, via Pewaukee, Oconomowoc, Neosho, Hutisford and Juneau. It is the intention to have this road in operation by January of the coming year. W. A. Dunn, President, Majestic building, Milwaukee, Wis.; C. A. Chapman, Chief Engineer, Marquet building, Chicago.

MISSOURI & NORTH ARKANSAS.—An officer writes that during 1908 the company will finish work on its extension from Woodruff, Mo., to Neosho, 32.10 miles. The line has been finished from Leslie, Ark., south to Helena, 178.36 miles, except on a section of about eight miles, where track has not yet been laid through the White and Cache river bottoms. This work includes pile bridges aggregating 8,300 ft., and the bridge over the White river yet to be finished. The foundations of the bridge are finished. Two 125-ft. spans, a 300-ft. draw and a 60-ft. deck girder are in place. There remains some other steel bridges to be placed on completed masonry, and 75,000 cu. yds. of rock cut yet to be taken out around which the company is now operating on a 4 per cent. gradient, which is 50 ft. higher than the line will be when completed. (Oct. 16, p. 1177.)

MISSOURI PACIFIC.—This company has announced that it will make those improvements in the state of Kansas, estimated to cost about \$1,000,000, which have been recommended by the Kansas Board of Railroad Commissioners. Work on making these improvements will begin at once and will continue without intermission, weather conditions permitting.

NEVADA & CALIFORNIA.—See Southern Pacific.

NEW YORK, NEW HAVEN & HARTFORD.—At a recent meeting of the Board of Estimate and Apportionment of New York City favorable action was taken upon two petitions of the New York, Westchester & Boston, which is controlled by the New Haven through the Milbrook Company. The first petition was for a change of line between 174th street and the Harlem river on its main line and a slight modification in the Throgg's Neck branch, and the second petition was for the following modifications of the ordinance approved by the Mayor

August 2, 1904: (a) By permitting the use of the overhead trolley system; (b) by providing the city with the right to string three cables instead of furnishing the city with two conduits; (c) by permitting connections with two other railways at a distance not exceeding 2,500 ft. instead of 1,000 ft.; (d) by permitting connections with the existing rapid transit railway at West Farms and the proposed rapid transit railway to be constructed on Westchester avenue; (e) by extending the time until August 2, 1911, in which to complete a four-track railway from the city line to 174th street and until August 2, 1913, for the construction of the line from 174th street to the Harlem river. The change in line between 174th street and the Harlem river removes the Westchester line from its former position where it ran parallel to Boone street and as far as Jennings, and thence in a straight line to Dongan street east of the Southern boulevard and thence east of the Southern boulevard to a point at or near 140th street, where it curved to the west, and running parallel to 140th street as far as Alexander avenue, and thence to the Harlem river at a point west of Lincoln avenue to a position coinciding with the Harlem branch of the New York, New Haven & Hartford, which is being six-tracked. The new position of the New York, Westchester & Boston lies so that one-half of its four-track right of way falls within right of way of the Harlem branch, and it is proposed by the Westchester company to purchase from the New Haven two of the six tracks. The change in the line of the Throgg's Neck branch is not material.

NEW YORK, WESTCHESTER & BOSTON.—See New York, New Haven & Hartford.

NORTHWESTERN RAILROAD.—See Oregon Short Line.

NORWOOD & ST. LAWRENCE.—An officer writes that surveys have been made to build under the name Raymondville & Waddington an extension from the present northern terminus at Raymondville, N. Y., west to Waddington, 13 miles. Work is now under way on first three miles from Waddington.

OREGON SHORT LINE.—An officer writes that contract has been given to the Utah Construction Co., of Ogden, Utah, for an extension of the Northwestern Railroad from Robinet, Ore., to Homestead, 26 miles. (See Northwestern Railroad, Jan. 3, p. 36.)

Press reports indicate that this company intends soon to double-track its line from Salt Lake City, Utah, northward about 12 miles.

PENHORN CREEK RAILROAD.—See Erie.

PENINSULAR RAILROAD.—See Southern Pacific.

QUEBEC, MONTREAL & SOUTHERN.—See Delaware & Hudson.

RAYMONDVILLE & WADDINGTON.—See Norwood & St. Lawrence.

REGINA INTERURBAN RADIAL (ELECTRIC).—Under this name a company is being formed to build lines in and around Regina, Sask. Mackenzie, Brown, Thom & Frame, of Regina, are the attorneys.

ST. LOUIS & ILLINOIS BELT.—An officer writes that contract has been given to the J. A. Ware Construction Co., 308 Houser building, St. Louis, Mo., for building an extension of this road from the present end of track to Edwardsville, Ill., 4 miles.

ST. LOUIS, BROWNSVILLE & MEXICO.—An officer writes that this company is building a spur line from Buckeye, Tex., to the plant of the Tres Palacios Rice & Irrigation Co., 5.25 miles. This may be developed and extended to form a 20-mile branch. Surveys made for an extension from Donna, Tex., to Sugar Mill, four miles. (Aug. 28, p. 839.)

ST. MAURICE VALLEY.—A subsidy contract at \$3,200 a mile, has been entered into with the Canadian government for the construction of a railway line from Three Rivers, Que., northwest to Grand Mere, about 28 miles.

SACRAMENTO SOUTHERN.—See Southern Pacific.

SAN ANTONIO & RIO GRANDE.—An officer writes that a contract has been given to the Hidalgo Construction Co. for building 25 miles of this line. The projected route is from

Brownsville, Tex., north to San Antonio, about 300 miles. S. A. Robertson, Chief Engineer, San Benito.

SIoux CITY & DES MOINES (ELECTRIC).—Press reports from Des Moines, Iowa, say that the American Engineering Co. has been given contract, at \$4,700,000, to build this proposed line. Announcement is made that work will begin early next spring. (Sept. 4, p. 889.)

SOUTHERN PACIFIC.—An officer writes that this company finished in 1908 a line from Colorado, Cal., to Potholes, 12.34 miles, also from San Ramon, Cal., to Pleasanton, 9.58 miles. (Aug. 14, p. 741.)

The Inter-California Railway, building from Calexico, Cal., through the northern part of Mexico to Hanlon Junction, Cal., 54.12 miles, during the year laid track on 13.35 miles, from a point 25 miles south of the international boundary, south to Tecolote in Mexico. (R. R. G., March 13, p. 394.)

The Peninsular Railroad, building from Mayfield, Cal., to Vasona, 16.25 miles, was finished from Monte Vista, Cal., to Vasona, 7.26 miles. (R. R. G., March 13, p. 394.)

The Nevada & California, building from Mojave, Cal., to Keeler, 146 miles, during the year laid track from Mojave to Siding No. 13 on 52.80 miles. (Dec. 15, p. 1561.)

The Central California, building from Niles, Cal., to Redwood City, 16.24 miles, laid track during the year from Newark to Redwood City on 7.08 miles. (R. R. G., March 13, p. 394.)

The Sacramento Southern, building from Sacramento, Cal., to Antioch, 54.10 miles, during the year laid track from Sacramento to Del Rio, 4.45 miles. (R. R. G., March 15, 1907, p. 392.)

The California Northeastern, building from Weed, Cal., north to Klamath Falls, Ore., 88.81 miles, during the year laid track from Erickson, Cal., north to Calor, Ore., 30.53 miles. (R. R. G., Oct. 18, 1907, p. 473.)

The Sunset Western, building from Pentland, Cal., north-erly 14.86 miles, during the year laid track from Pentland north, 12.73 miles.

An officer of the Cananea, Yaqui River & Pacific writes that this line is under construction from Aguascalientes, Sonora, to Nacimientito, 10 miles. Grant Bros. Construction Co., 620 Security building, Los Angeles, are the contractors.

SUGAR CREEK & NORTHERN.—See Wheeling & Lake Erie.

SUNSET WESTERN.—See Southern Pacific.

TAYLORVILLE-NOKOMIS TRACTION.—Incorporated in Illinois, with the principal office in Taylorville, to build an electric line from Taylorville south to Witt, thence northeast to Nokomis, about 25 miles in all. The incorporators include W. B. Adams and A. R. Adams, of Taylorville; A. Griffin and W. F. Brockman, of Nokomis.

TOPEKA-SOUTHWESTERN.—An officer of the Topeka Southwestern Construction Co., Topeka, Kan., writes that company is now at work building a line for the Topeka-Southwestern Railway from Topeka, Kan., southwest to Council Grove, about 60 miles. V. R. Parkhurst, of Topeka, is Chief Engineer of the railway company. (R. R. G., March 13, p. 395.)

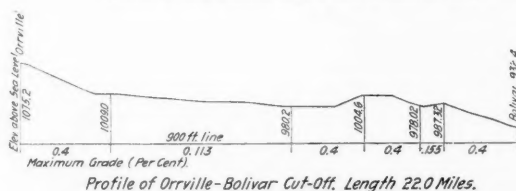
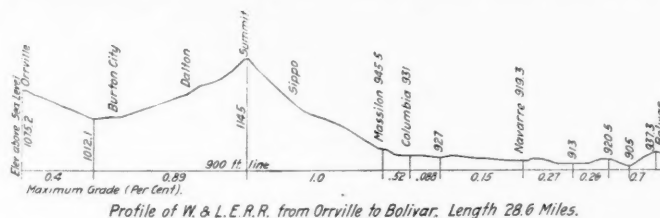
VANCOUVER, VICTORIA & EASTERN.—See Great Northern.

WESTERN PACIFIC.—An officer writes that work is now under way by the Utah Construction Co., of Ogden, Utah, and Maney Bros., of Winnemucca, Nev., on this road from Elko, Nev., west to Berry Creek, Cal., 440.7 miles, except on 9.3 miles which has track laid near Beckwith, Cal. No branch lines at the present time are under construction.

Newspaper reports say that the last shovel of earth was recently removed from the boring of the Spring Garden tunnel at Beckwith. The grade from the north fork of the Feather river to the middle fork of the same stream has been connected by an opening through the mountain 7,306 ft. long. It required nearly 27 months to blast the tunnel through. Work was begun on the approaches to the tunnel in September, 1905. The completion of the tunnel makes possible the crossing of the Sierra by the Western Pacific at a height of 5,019 ft., and the completion of the entire road with a maximum grade of less than 1 per cent. (Nov. 20, p. 1419.)

WHEELING & LAKE ERIE.—The accompanying line cut shows the profile of the present line from Bolivar, Ohio, northwest to Orrville, also of the new Brewster cut-off between these two points (being built under the name Sugar Creek & North-

ern), with a comparison of the physical characteristics of the old and new lines. The work of completing the Brewster cut-off was about two-thirds completed a year ago, when operations were stopped owing to a shortage of funds. The work



Comparison of Physical Characteristics of Old and New Lines between Orrville and Bolivar.													
Location	Length of Line, Miles		Max. Grade Feet per Mile Compensated		Maximum Curvature Degree		Total Angle Degrees		Total Curvature Miles		Per Cent		
	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	
			Distance Spared										
Orrville to Bolivar	28.6	22.0	6.6	53.0	21.1	9°	3°	16.32	537	11.85	5.6	0.41	0.283

Profiles of Lines Between Bolivar, Ohio, and Orrville.

was resumed during the latter part of November. An officer writes that it is hoped that the entire 22 miles of the cut-off will be placed in operation within a few months. (May 29, p. 748.)

Railroad Financial News.

BOSTON & MAINE.—The directors on December 16 voted to call for tenders for refunding floating debt by the issue of \$11,700,000 20-year bonds.

CANADIAN NORTHERN.—This company has bought the Duluth, Rainy Lake & Winnipeg. The line runs from Fort Frances, Ont., to Virginia, Minn., having in operation about 93 miles.

CHESAPEAKE & OHIO.—Potter, Choate & Prentice, New York, are offering \$600,000 general mortgage 4½ per cent. bonds of 1892-1992 at 106, yielding about 4.25 per cent. There are \$43,573,000 of these bonds outstanding, the total authorized issue being \$70,000,000.

DULUTH, RAINY LAKE & WINNIPEG.—See Canadian Northern.

METROPOLITAN STREET RAILWAY.—The joint reorganization committee, John W. Castles, chairman, has engaged Stone & Webster, of Boston, to assist in the reorganization of the Metropolitan Street Railway. Stone & Webster own or control a number of street railway properties throughout the United States.

NEW ORLEANS, FORT JACKSON & GRAND ISLE.—C. D. Haines, President, has filed a petition asking that the lease of property of this company to the New Orleans Southern be declared void, alleging that neither lessee nor lessor had the power to make the lease. The N. O., Ft. J. & G. I. runs from New Orleans, La., to Buras, 60 miles.

ST. LOUIS TRANSIT CO.—J. B. Johnson, holding claims amounting to \$30,000, has applied for a receiver. The St. Louis Transit Co. was merged with the United Railways of St. Louis. The stockholders of the Transit company received \$11 in cash and one share of common stock of the United Railways for each share of the Transit company's stock.

SEABOARD AIR LINE.—The receivers have been ordered to show cause why the road should not be sold and a judgment of \$4,500 paid to Hoover & Denham, merchants, who furnish supplies to the company's dining cars.

UNITED RAILWAYS OF ST. LOUIS.—See St. Louis Transit Co.

VIRGINIAN RAILWAY.—There were sold at public auction on December 9 a block of 100 shares of stock, the sale being at 23%. This is the first public sale of Virginian Railway Stock.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Carolina, Clinchfield & Ohio has ordered one Mallet (2-6-6-2) locomotive from the Baldwin Locomotive Works.

The Chicago & Alton has ordered 10 consolidation, five Pacific and five switching locomotives from the American Locomotive Co.

The Union Railroad, Pittsburgh, Pa., is said to have ordered 15 locomotives from the American Locomotive Co. This item is not confirmed.

The Pittsburgh & Lake Erie, reported in the Railroad Age Gazette of December 11, has ordered five 10-wheel passenger locomotives from the American Locomotive Co. for delivery about April 1.

The Duluth & Iron Range has ordered four simple consolidation locomotives from the Baldwin Locomotive Works. These engines will weigh 194,000 lbs. and will have cylinders 22 in. x 28 in.

The Bessemer & Lake Erie has ordered 15 consolidation and two eight-wheel locomotives from the American Locomotive Co. and four six-wheel and two consolidation locomotives from the Baldwin Locomotive Works.

The Pennsylvania has just begun the construction of 15 consolidation locomotives at its Juniata shops.

General Dimensions.

Diameter of drivers	62 in.
Boiler, type	Belpaire
Boiler, working steam pressure	205 lbs.
Tubes, number	465
" diameter	2 in.
" inside diameter	76%
" length	15 ft.
Heating surface, total	3,839 sq. ft.
Grate area	55.13 sq. ft.
Water capacity	7,000 gals.
Coal capacity	13 1/4 tons.
Tractive effort	42,661 lbs.

The Kenesick, Quigley, Russell Construction Co., Kansas City, Mo., has ordered eight simple switching locomotives from the Davenport Locomotive Works.

General Dimensions.

Weight on drivers	72,000 lbs.
Total weight	72,000 lbs.
Cylinders	16 in. x 24 in.
Diameter of drivers	50 in.
Boiler, type	Straight top
Boiler, working steam pressure	160 lbs.
Heating surface, tubes	920.2 sq. ft.
" firebox	87.1 "
" total	1,007.3 "
Tubes, number	160
" diameter	2 in.
" length	132 3/4 "
Firebox, length	65 "
" width	32 3/4 "
" front depth	56 3/4 "
" back depth	53 1/2 "
Grate area	14.8 sq. ft.
Tender, style	Sloping back
" truck	Bettendorf
" water capacity	3,000 gals.
" coal capacity	4 tons

Special Equipment.

Boiler and firebox steel	Lukens
Tires	Midvale
Springs	Pittsburg Spring & Steel Co.
Valves	Richardson
Injectors	Ohio
Couplers	Washburn
Journal bearings	Phosphor-bronze
Headlights	Star
Brakes	Westinghouse
Tender brake beams	Simplex
Safety valves	Consolidated
Lubricators	Chicago
Metallic packing	Jerome
Steam gages	Ashcroft
Whistles	Crosby

CAR BUILDING.

The International & Great Northern is in the market for six chair cars.

The Delaware, Lackawanna & Western is reported in the market for 500 refrigerator cars. This item has not been confirmed.

The Spokane, Portland & Seattle is asking prices on 200 forty-ton box cars.

The Chicago & Eastern Illinois is asking prices on 60 freight cars of various types.

The Erie & Michigan Railway & Navigation Co. is in the market for 200 box cars.

The Colorado & Southern has asked prices on 19 coaches and 10 mail and baggage cars.

The United Railways, Portland, Ore., have ordered two large cars from the American Car Co.

The Illinois Traction System, Champaign, Ill., is in the market for 25 forty-ton box cars.

The Northern Pacific is asking prices on 200 freight cars for the Spokane, Portland & Seattle.

The National Car Line Co., Chicago, is in the market for 200 thirty-ton steel underframe beef cars.

The Seaboard Air Line is asking prices on passenger cars. The number reported as desired is from 15 to 55.

The Third Avenue Railroad, New York, is said to be in the market for 200 cars. This item is not confirmed.

The Wisconsin Northern has ordered one combination passenger and baggage car from the Barney & Smith Car Co.

Morris & Co. Refrigerator Line, Chicago, has ordered 200 thirty-ton refrigerator cars from the Haskell & Barker Car Co.

The Western Maryland has ordered 500 fifty-ton steel hopper cars from the Cambria Steel Co. and 12 cabooses from the South Baltimore Steel Car & Foundry Co.

The Virginian Railway, reported in the Railroad Age Gazette of October 30 and November 20 as asking prices on 1,500 fifty-ton steel coal cars, has ordered this equipment from the Pressed Steel Car Co.

The Rock Island Southern (Electric), Monmouth, Ill., reported in the Railroad Age Gazette of November 27, has ordered 17 sixty-ft. combination baggage and passenger motor cars and eight trailers from the St. Louis Car Co. for delivery by April 1.

The Indian Refining Co., Cincinnati, Ohio, reported in the Railroad Age Gazette of November 20 as having ordered 75 tank cars from the German-American Car Co., has ordered 85 thirty-ton tank cars from this company, and 52 thirty-ton and 30 forty-ton tank cars from the American Car & Foundry Co.

The St. Louis Southwestern, reported in the Railroad Age Gazette of December 4 as having ordered 35 passenger cars from the American Car & Foundry Co., has included the following in this order: Ten steel underframe baggage, five steel underframe mail and express and three composite underframe parlor cars.

The San Antonio & Aransas Pass specifications for 500 ventilated fruit and vegetable cars and 200 stock cars to be built by the American Car & Foundry Co., reported in the Railroad Age Gazette of December 11, should have included the body bolsters to be furnished by the Scullin-Gallagher Iron & Steel Co. The truck bolsters are to be of the Simplex type.

The Canadian Pacific, as reported in the Railroad Age Gazette of November 20, has ordered 500 forty-ton box cars from the Dominion Car & Foundry Co. These cars will be 36 ft. long, 8 ft. 6 in. wide, inside measurements, and 39 ft. 10 1/4 in. long, 9 ft. 3 1/2 in. wide over all. The special equipment includes:

Brake-shoes	Steel back; Am. Brake Shoe & Foundry Co.
Side doors	Security
Roofs	Chicago Winslow Improved

The Duluth & Iron Range, reported in the Railroad Age Gazette of November 20 as being in the market for 1,000 steel ore cars, has ordered 800 fifty-ton steel ore cars from the Summers Steel Car Co., Pittsburgh, Pa., for delivery in March and April. These cars will be built at the Hammond, Ind., works of the Standard Steel Car Co. They will be 24 ft. long, 9 ft. 5 in. high and 8 ft. 6 in. wide, outside dimensions. A new feature will be the center dump, with a discharge opening of 5 ft. 6 in. x 8 ft. 6 in., all slopes inside the car being at an angle of 50 deg.

IRON AND STEEL.

The Northern Pacific has ordered 25,000 kegs of bolts from the Illinois Steel Co.

The Wisconsin Central has ordered 7,000 kegs of spikes and bolts from the Illinois Steel Co.

The Wabash-Pittsburgh Terminal Co. has ordered 500 tons of rails from the Carnegie Steel Co.

The Missouri Pacific has ordered 35,000 kegs of bolts and 35,000 kegs of spikes from the Illinois Steel Co.

The Pittsburgh Railways Co., Pittsburgh, Pa., has ordered about 500 tons of rails from the Carnegie Steel Co.

The Wheeling & Lake Erie is said to have ordered several thousand tons of structural steel for bridge construction.

The Copper River & Northwestern has ordered 3,300 tons of structural steel from the American Bridge Co. for bridge construction in Alaska.

The Pennsylvania, although official announcement has not yet been made, is understood to have placed orders on December 16 for 135,500 tons of rails, distributed as follows: Illinois Steel Co. and Carnegie Steel Co., 62,500 tons; Cambria Steel Co., 25,000 tons; Pennsylvania Steel Co., 25,000 tons; Lackawanna Steel Co., 13,000 tons; Bethlehem Steel Co., 10,000 tons.

RAILROAD STRUCTURES.

ST. BONIFACE, MAN.—Reports from Ottawa say that the National Trans-Continental Railroad Commission has decided to cancel the contract given to Kelly Bros., of Winnipeg, Man., for terminal shops at St. Boniface, Man. Bids are to be asked for at once for the entire buildings required for these shops. R. S. Poulin is Resident Engineer at St. Boniface. (Sept. 25, p. 1021.)

SANTA FE, N. MEX.—The Atchison, Topeka & Santa Fe will build a new passenger station here. Work will begin as soon as a location is secured. The present station will be used as a freight house.

TACOMA, WASH.—The Northern Pacific has planned extensive new freight and warehouse terminals to be located opposite the proposed Great Northern freight terminals on Twenty-first street, extending east from Railroad avenue. Application has been made to the Tacoma City Council for the vacation of parts of eight streets. The buildings, if the franchise is granted, will be erected on the south side of Twenty-first street from Railroad avenue to River street.

The Great Northern has an application before the City Council for a piece of ground for terminal purposes at Railroad avenue and Twenty-first street. (See Dec. 11, p. 1564.) The Great Northern will use the proposed passenger station of the Northern Pacific, mentioned in the *Railroad Age Gazette* (July 17, p. 549). It is thought that an agreement between the City Council and the Great Northern and Northern Pacific will soon be reached.

SIGNALING.

The Oregon Short Line, in connection with the double-tracking of a portion of its line between Salt Lake City and Ogden, Utah, will install automatic block signals throughout the length of this section, 37 miles.

The Boston & Maine, which now has about 15 per cent. of its passenger lines worked by the block system, has during the past year done a large amount of work on new installations of automatic block signals, and expects to complete early next year about 214 miles additional—189 miles of double track and 25 miles of one track. (This is part of a double-track line which now has automatic signals on one of its tracks.) With this work completed, the road will have 507 miles of line equipped with automatic signals. The company has decided to install automatic block signals on all of its more important single-track lines (as well as on double-track), and to extend the automatic signaling each year.

The main line of the Delaware & Hudson is now equipped with automatic block signals throughout from Wilkes-Barre, Pa., to Plattsburg, N. Y., which is within 20 miles of the northern terminus at Rouses Point. The company has one

double-track branch 14 miles long, which has automatic signals on one track only. The other track will be equipped during the coming year. Of the automatic signaling in use on this road more than nine-tenths of the mileage is worked by electro-gas semaphore signals, "normal danger." The company has now under construction an all-electric interlocking by the Federal Signal Co. The Federal is also erecting for the company a mechanical interlocking with a 44-lever machine in place of older interlocking of 20 levers.

Signal Blades de luxe.

On the occasion of the meeting of the Railway Signal Association in Washington last October the members who visited the Baltimore & Ohio yard saw some semaphore signal blades which shone in the sun like the golden dishes in the dining room of a railway "magnate's" private car; and were told by Mr. Patenall, Signal Engineer of the road, that they had been found satisfactory. The faces of these blades were covered with gold leaf. It appears that the use of blades thus painted is being extended on the B. & O. and any one who may have thought that such a gorgeous display was a mere fancy, or was out of place, as being too costly, will have to revise his opinion. Mr. Patenall thinks that the results of his experiment will justify its continuance as standard practice, for the reason that under all varieties of background the arm so prepared presents a more distinct aspect; and, of course, the color of the arm has no significance as an instruction to the runner.

The use of gold leaf in covering signal arms was suggested by W. S. Schenck, master carpenter of the Connellsville division of the road, and a special study of the subject has been made by J. D. Wright, general foreman painter at the shops at Baltimore. In order to prepare a suitable foundation and ground for the gold leaf, new signal blades receive three or four coats of paint, according to the roughness of the surface, and are sand-papered down thoroughly. The first two or three coats are surfaced in a way similar to that used for the foundation coats of passenger cars, and are applied in the same manner; or they may be painted with white lead tinted with yellow. When the yellow is used the first coat of lead is thinned with one-half linseed oil and one-half turpentine, and the subsequent coats with one-fourth linseed oil and three-fourths turpentine, each coat being sand-papered. In either case the last coat should preferably be made a gold color, so that the ground will not show badly when the leaf begins to wear off. After the foundation, or ground, has been prepared, a coat of fatty linseed oil sizing is applied. This is allowed to stand about 24 hours when it has sufficient adhesiveness to hold the leaf without dimming its luster. The gold leaf is then laid on the sizing and the surface is burnished with raw cotton. Gold leaf applied in this manner, it is claimed, will stand weather exposure for 15 or 20 years.

The cost of preparing the blades in this manner averages 90 cents each, in quantities, and it is believed that the method will result in considerable economy in avoiding the necessity of painting arms. In order to obtain with paint results equal to the use of gold leaf the painting would have to be done six times a year, at a cost of approximately 25 cents an arm, or a total of \$1.50 per annum per arm.

To maintain these gold leaf arms in good condition a mild solution of oxalic acid is used, with which the arm is sponged off at such intervals as may be found necessary.

Safety Appliances Recommended in Washington.

A. W. Perley, Inspector of Railway Tracks and Safety Appliances for the Railroad Commission of Washington, has made a report to the Commission in which he says that the state 16-hour law is disregarded by the railways. Mr. Perley recommends legislation to require that switch engines be equipped with foot boards, the bottom of which shall not be more than 10 nor less than 7 in. from the top of the rail, and which shall be not more than 1½ in. thick and shall have a toe board at least 4 in. high. Such engines should also be equipped with grab irons or with an uncoupling lever properly placed for a grab iron. Mr. Perley says that engines are being operated in a defective condition that permits steam

to escape in such volume that enginemen are sometimes unable to see as far as the front of their engine, and he recommends that a penalty be attached by law for using an engine thus defective.

Supply Trade News.

The G. Drouve Company, Bridgeport, Conn., has bought at a receiver's sale all machinery, material and fixtures of the American Machinery Co., 651 West Forty-third street, New York.

The requisitions on the Purchasing Agent from the Mt. Clare, Md., shops of the Baltimore & Ohio for December contain 81 full sheets, which is the largest requisition from these shops in 10 years.

The Farlow Draft Gear Co., Baltimore, Md., will supply the draft gear for the 500 cars recently ordered by the Western Maryland and for the 275 cars ordered by the Newburgh & South Shore.

A. H. Carpenter, General Coal Agent of the Tennessee Coal, Iron & Railroad Co., has been elected Vice-President in charge of operation of the Birmingham Car & Manufacturing Co., Birmingham, Ala.

The Wyandotte Co., Chicago, has been incorporated to manufacture and sell railway appliances and supplies. The incorporators are Charles F. Lewy, Albert Goetz and Arthur W. Goetz. The capital stock is \$10,000.

The W. K. Kenly Co., Chicago, has been appointed Chicago representative of the American Metal Hose Co., New York city. This company furnishes metal for high pressure steam service, compressed air, water, oil, naphtha gas, acid, etc.

The Interlocking Journal Bearing Co., New York, has been incorporated to make equipment, supplies and devices for railways, cars and locomotives. Capital stock, \$100,000. The incorporators are: John J. Donovan, Thomas Hill Lowe and Noah A. Stancliffe, 165 Broadway.

The first revocation of a foreign patent in Great Britain under the recent law occurred on December 10, when one held by a Belgian for making tiles was canceled on the ground that there was no valid reason for the manufacture of the tiles not being prosecuted in Great Britain instead of Belgium. The patentee was mulcted in the costs.

Herbert E. Stone has just become Manager of Sales in the Eastern department of the Dearborn Drug & Chemical Works, Chicago. His headquarters will be in New York city. Mr. Stone was formerly President of the N. A. S. E., and recently manager of the Pittsburgh office of the Chapman Valve Company. He will have with him a competent corps of assistants.

The net earnings of the American Car & Foundry Co., New York, for the quarter and six months ended October 31, 1908, were as follows:

	1908.	1907.
August 1 to October 31		
Net earnings	\$694,664	\$2,775,643
Preferred dividend	525,000	525,000
Balance	\$169,664	\$2,250,643
Common dividend	150,000	300,000
Surplus	\$19,664	\$1,950,643
May 1 to October 31		
Net earnings	\$1,378,705	\$5,368,621
Preferred dividends	1,050,000	1,050,000
Balance	\$328,705	\$4,318,621
Common dividend	300,000	600,000
Surplus	\$28,705	\$3,718,621
Previous surplus	22,367,248	19,552,630
Total surplus	\$22,395,953	\$23,271,251

In the recent fire at the works of Rhodes, Curry & Co., Ltd., Amherst, Nova Scotia, only the passenger car erecting shed was destroyed. The firm is now replacing this with materials from its own mills and works, and expects to be setting up cars in it about the first week in January. No machinery was run in this building, so nothing new in that line will be required.

The Cement Products Exhibition Co., Chicago, is completing

arrangements for the second annual cement show in Chicago on February 18-24. It will be held in the Coliseum, and about four-fifths of the main floor space has already been contracted for. The Central Passenger Association and the Eastern Canadian Passenger Association have made rates of a fare and a half for the round trip for this occasion.

TRADE PUBLICATIONS.

Chicago, Burlington & Quincy.—"Colorado as a Winter Resort" is made the subject of a 16-page folder describing the attractive features of Colorado. It contains 20 illustrations of various buildings, views and players at games.

Portland Cement.—The December bulletin of the Universal Portland Cement Co., Chicago and Pittsburgh, contains an article describing the Fort St. Phillip Sea-Wall near New Orleans, La., and an article on the government break-water at Algoma, Wis.

Chain Blocks, Electric Hoists, etc.—The Yale & Towne Manufacturing Co., New York, has just issued a catalogue which describes in detail its line of chain hoists, both hand and electric, also trolleys, trolley tracks, etc. The catalogue contains a large number of half-tone cuts of this apparatus, also illustrations of shop installations.

Expanded Metal.—An article on "The Use of Expanded Metal in Reinforcing Concrete" by Ernest McCullough, Chief Engineer of the Northwestern Expanded Metal Co., Chicago, which appeared in the October issue of *Concrete*, has been issued in pamphlet form by the Northwestern company. The article is complete with the exception of two tables showing the strength of reinforced slabs. These tables are among the complete set to be found in the pamphlet on roof and floor slabs, mention of which was made last week.

Magneto Telephones, Generators and Motors.—The Western Electric Co., New York, has just issued three booklets on electrical apparatus. Circular No. 1,078 describes No. 1,317 magneto telephone wall sets, designed for meeting the requirements of rural telephone service. Instructions for installation and operation of design E generators and motors are given in a booklet of some 20 pages and similar information regarding design L generators and motors is given in another booklet.

Bulletin No. 5,113, of standard size for loose leaf binder, contains a description of three-wire generators of L design. The different parts are described separately, with detailed illustrations of each. These generators have only one slip ring and no auxiliary apparatus is necessary for their operation.

Waterproofing in Refrigerating Work.*

Insulating means waterproofing. Waterproofness means insulation. * * * The asbestos lagging, for instance, enveloping and insulating a locomotive boiler, to retain the heat, would be worthless if it were not waterproofed by the steel plates covering the lagging. The principle works the same, whether in retaining heat or in retaining cold. In the past the refrigerating engineer seems to have been amply satisfied with lining air spaces—whether filled or not with one of the many insulating materials on the market—with not even an impervious felt, but ordinary thin, waterproof paper, carelessly tacked in place. * * * Waterproofing applies to every part of cold storage construction—to the foundation of the building, to the walls above grade, to the roof, to the various floors, to the partitions separating the different compartments, to the ceilings, etc., etc. * * *

In actual work we would submit the following recommendations for practice:

First.—Properly design the thing to be waterproofed. Use no set specification. Each condition has its characteristics and should be carefully considered, especially with reference to the character and use of the structure.

Second.—Select the best materials obtainable for the desired purpose.

Third.—See to the correct application of the materials. In water-pressure work, as in foundations, employ only skilled labor, thoroughly experienced in such work.

The foundation walls should be waterproofed and insulated on the exterior, specially prepared, surface with a thick, tough, elastic stratum of waterproofing composed of alternate layers of impervious felt and

*From a paper read before the American Society of Refrigerating Engineers, by Edward W. DeKnight, President of the Hydrex Felt & Engineering Co., New York.

bitumen. Use as many layers of felt as the conditions require, according to the water pressures, etc.; in any event, use not fewer than two layers of felt. Carry the stratum under the foundation floor. Thus insulate and waterproof the foundation, forming practically a waterproof box in which the foundation proper is set. It pays to protect the waterproofing stratum on the walls with a layer of cement mortar or a course of brick.

In the perfect cold storage structure there can be well afforded above grade an outer or curtain wall and an inner or wall proper. Line the interior surface of the curtain wall, or if no curtain wall be used, the interior surface of the wall proper, with one layer (two would be better) of impervious felt cemented to the wall, thus forming thereon a membrane through which air and moisture cannot pass.

Similarly treat all sub-divisions of the wall which may be divided into air spaces, whether or not they be filled with an insulating material. This forms on both sides of the insulating medium an impervious, air-tight membrane, which not only perfects the air space, but preserves the efficiency of the insulating material by protecting it against the entrance of air and moisture.

Also similarly treat the floors, ceilings and partitions of each compartment. When the compartments are of wood, lap the felt sheets 3 inches, cement the laps only and tack same.

Under and over each layer of insulating material in floors apply one sheet of impervious felt, lapped 3 inches and the lap tightly cemented.

If the wearing or walking surface of the floors be of mastic or of concrete, apply under same three layers (though two would serve) of impervious felt, thoroughly cemented together with the special bitumen, so as to form a strong, pliable waterproof stratum under the wearing surface. This will effectually stop any moisture and water from condensation or other causes working its way down through cracks in the cement wearing surface and destroying the usefulness of the insulating material. * * *

Cover the roof with three or four layers of impervious felt cemented together with hot bitumen. Cover this waterproof stratum with a course of brick laid flat or a thin layer of cement, over which place good soil 6 inches deep. Then sow same with grass seed. This will provide a cool, insulating roof which cannot be excelled for cold storage buildings. At the same time it utilizes valuable roof space which now goes to waste. * * *

Pittsburgh Screw Spike.

During the past two years there has been an increasing use of screw spikes, especially in softwood ties. The Pittsburgh Forge & Iron Co., Pittsburgh, Pa., has been furnishing a moderate cost screw spike, quite similar, in form and pitch of thread, to the standard adopted in France by the Paris, Lyons & Mediterranean Railway, where the most elaborate trials have been made. The Pittsburgh spike, however, made by a peculiar process, is a better finished product, easier to put in place and less damaging to the wood fibre. It should have greater holding power and leave the least possible chance for water to do damage. Some of the summarized results of the elaborate



Screw Spike; Pittsburgh Forge & Iron Co.

experiments made in 1907 by Roy I. Webber, of the University of Illinois, and printed in the *Railroad Gazette* August 9, 1907, are worth repeating:

"The maximum resistance to direct pull varies from 6,000 to 14,000 lbs. for screw spikes; from 3,000 to 8,000 lbs. for ordinary spikes."

"The efficiency of screw spikes to resist withdrawal is nearly twice as great as that of common spikes."

"Screw spikes are more efficient than ordinary spikes in resisting lateral displacement."

Aside from the value there may be in holding the rail firmly to the tie, there is also the added life of the tie due to avoidance of re-spikeing.

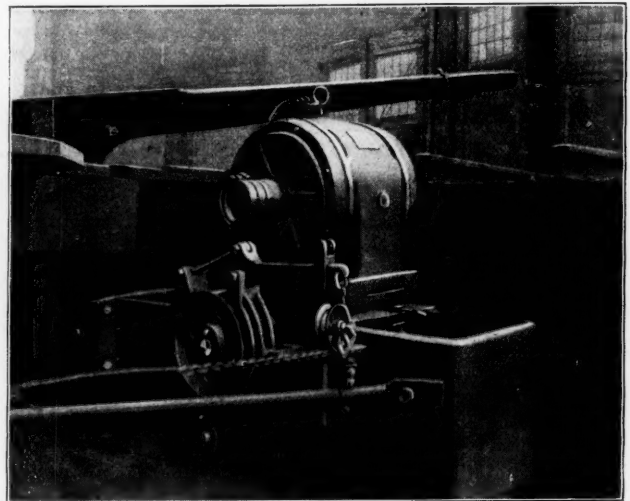
Leak-No Metallic Compound.

The H. W. Johns-Manville Co., New York, is putting on the market the Leak-No metallic compound for filling in defects in castings, pipes and other parts which have become useless because of cracks, spongy spots, sand holes or blow holes. It is a chemical compound resembling powdered iron. When mixed with water and applied like putty the manufacturers claim that it metallizes, becoming a permanent part of the article to which it is applied. This process takes place in a few hours. During it, the compound expands so that it perfectly fills the leak, and as it expands equally with iron and steel, it makes a per-

manent repair. When hard it has the same color as cast iron. The great advantage of it is that it does not adhere like a cement, but amalgamates with the metal itself, so that it will hold great pressure and will not flake off. It resists any heat, acid, gas or oil that iron will stand. The makers guarantee its ability to do this, and also to stop any ordinary leak, in anything made of iron or steel, against any pressure of oil, steam, gas, air, ammonia or water, when applied according to directions; the purchase price being refunded in case of failure. Other uses in addition to those first mentioned include: flange unions, using a fine wire mesh and a roll of compound; joints, screw threads, etc.; water tight joints between the ends of steel plates; and joints and prism light settings where lead is usually used.

Motor-Operated Turntable.

A striking example of the economy and convenience which results from the use of electric power for moving turntables is shown by the installation of a motor on a turntable on one of the railways in New York state. This turntable was formerly operated by hand, requiring the time of a number of men at intervals, which averaged the continuous service of two men for 24 hours a day. The donkey was equipped with a standard Westinghouse induction motor, type F, high



Westinghouse Motor Operating Turntable.

torque, rated at 20 h.p., 200 volts, two-phase, 60 cycles. This reduced the labor required to one man per day of 24 hours.

Inasmuch as the men were paid 15 cents an hour in each case, this motor saved \$3.60 a day, or \$1,314 a year. As the cost of power for the motor has averaged but \$8 a month, a total of \$96 a year, the net saving is \$1,218 a year. The total cost of the electrical equipment, including the cost of installing the outfit, was approximately \$1,500, which is but slightly greater than the actual saving in one year. As a result of this installation four other turntables have been supplied with electrical equipment by the same railway, and plans are on foot for similarly equipping several more.

The economy is not the most important point. The work of a turntable is intermittent and is usually rushing for a short time and then at a standstill, especially at terminals, where many locomotives often come in at once. The time required to turn a locomotive by hand depends largely on the number of men available to do it, but even with the handles full, which requires from four to eight men, it is impossible to do the work as rapidly as with a motor. Saving time at such periods is of great importance, as the congestion at the turntables is relieved and the movement of traffic is expedited.

The method of supplying power to the table has some interesting details. A bridge is used with overhead wires, which run to a standard Westinghouse overhead collecting switch, mounted over the center of the turntable. This switch has brushes and collector rings so that contact is made at all times and in all positions of the turntable. There is no strain on the line wires, as the cross arm to which they run does not move with the table, but is stationary while the table revolves.

In this installation, the cab is mounted on the center of the turntable, so that the wires run directly from the bridge to the cab and to the motor. In many instances, the cab is mounted at one end, but instead of being directly on the table, it is mounted on the donkey directly over the motor, to avoid the jolting which the cabman would get when the locomotives run on and off.

In many cases, especially in a new installation, the feed wires are run underground in conduit and brought up through the king-pin in the center of the table. The same type of switch mentioned above is placed between the tracks and the connections made from this point in the usual manner.